Design components of lifestyles in sustainable urban systems: Inter- and transdisciplinary studies

Thesis
presented to the Faculty of Arts
of
the University of Zurich
for the degree of Doctor of Philosophy
by

Robert Bügl

citizen of Germany

Accepted in the fall semester 2011
on the recommendation of
Prof. Dr. Roland W. Scholz and Prof. Dr. Heinz Gutscher

Zurich, 2011

“A building is a human being’s space and the background for his dignity and its exterior should reflect its contents and function.”

Gottfried Böhm, in his Ceremony Acceptance Speech when receiving the Pritzker Architecture Prize, 1986

Acknowledgements

I want to thank all those who have helped in achieving this thesis throughout my research stay at the Eidgenössische Technische Hochschule Zurich (ETHZ). As a psychologist, it has been an honour to be a member of the Natural and Social Science Interface (NSSI) at the Institute of Environmental Decisions (IED). I am sincerely grateful for the kind expert supervision and guidance of my supervisor Prof. Dr. Roland W. Scholz. He gave me the opportunity to join his group, accepted me as a Ph.D. student, and introduced me to the theory of human-environment systems, case study methods, and environmental sciences. I thank Prof. Dr. Roland W. Scholz for his highly appreciated contribution in writing, co-authorship and support in all stages of the research and publication process. The possibility to learn from him has been an invaluable experience. It has been a privilege to share his enormous interdisciplinary, transdisciplinary and methodological expertise that he has collected during his professional life as a mathematician, psychologist, and environmental scientist.

The project “Investors Construct Lifestyles” was funded by a grant from the Swiss National Science Foundation (SNSF) in its National Research Programme (NRP) 54 “Sustainable Development of the Built Environment” (Project Number 405440-107075/1). Dorin Kaiser, Daniel Lehmann Pollheimer, Daniel Wiener and Prof. Dr. Roland Scholz were responsible for fundraising. My warm gratitude goes out to all those who guided the project by many discussions, encouragements and constructive feedbacks: Daniel Wiener (leader), Prof. Dr. Roland W. Scholz (co-leader), Dr. Maria Lezzi (co-leader), Daniel Lehmann Pollheimer (coordinator) and Jürg Degen (coordinator). I wish to express my thanks to Dr. Stefan Husi, Rainer Klostermann, Prof. Dr. Simon Marvin and Urs Steiger for their highly appreciated support and coordination tasks at the SNSF.

The scientific advisory board provided invaluable reviews of various project reports and presentations: Prof. Dr. Kees Christiaanse, Dr. Andrea Martel Fus, Prof. Dr. Pascal Gantenbein, Prof. Dr. Werner Georg, Prof. Dr. Kerstin Höger, Prof. Dr. Simon Marvin, Astrid Peissard, and Prof. Dr. Klaus Selle. A special thanks goes to Prof. Dr. Heinz Gutscher who agreed to co-examine this thesis. Prof. Dr. Werner Georg enriched this thesis by his profound sociologist view on lifestyle research, which he shared in numerous publications and discussions.

I am deeply indebted to Dr. Peter Loukopolous who guided this thesis as an exemplary team leader during the first year of research. I greatly benefitted from the detailed information on sustainable finance provided by Prof. Dr. Thomas Koellner, and on mobility behaviour provided by Dr. Peter de Haan. The success of this thesis would not have been possible without the extraordinary transdisciplinary expertise and support of Dr. Michael Stauffacher. He helped in structuring the transdisciplinary process, and extraordinarily contributed in writing and improving the scenario assessment manuscript.

I want to thank my colleague Dr. Ulrich Kriese for his highly appreciated collaboration on the project, assistance in data collection, and many enriching contributions from a historical- and communication-science perspective. I thank all colleagues who contributed by reviewing papers, providing constructive critique, or giving practical support of the Erlenmatt Exploration Parcours: Julia M. Brändle, Dr. Marie-Eve Cousin, Rainer Gabriel, Dr. Dongbin Huang, Dr. Pius Krütli, Dr. Michel G. Müller, Dr. Anja Peters, Dominik E. Reusser, Dr. Andy Spörri, Dr. Timo Smieszek, and Dr. Stefan Zemp. My special thanks goes to Maria Rey, the cheerful soul of NSSI. The design of Sandro Bösch helped to improve numerous figures. Andy Aragai was a helping hand as system administrator for Mac.

I thank Christian Leimgruber and Guido R. Hüni for data sampling and their substantial contribution in developing the research design of the study on sustainable real estate funds.

The Vivico Real Estate GmbH, Dr. Elmar Schütz, Anke Giesen and Thomas von Amelunxen supported the transdisciplinary process and inappreciably helped to accommodate the Erlenmatt Exploration Parcours. I thank Tom Huber, School Director of the Swiss International School in Basel for his friendly hosting. I am deeply indebted to Jolanda Fritschi, Esther Furger, Isabelle Gutzwiller and Florence Roth who assisted and enriched the Erlenmatt Exploration Parcours in an admirably professional manner.

Much thanks also to the numerous experts and participants of the empirical pretests and studies in the different modules of this thesis. They shared their invaluable practical experience in sustainability, building and finance and offered their highly appreciated time.

I want to thank Sue for her patience, helpful support, and just for being there.

The thesis is dedicated to my family, thinking in memoriam of Dr. Frank Lettke.

Zurich, October 2011

Abstract

Three traditional strands of lifestyle research can be identified in more than a hundred years: consumer, health, and housing lifestyles. These traditional strands of lifestyle research were studied in different academic disciplines such as psychology, sociology, economics, medicine, urban studies, and environmental sciences. Lifestyles were, however, not explored in-depth from an interdisciplinary and transdisciplinary sustainability perspective on human-environment systems (HES). Fostering sustainable lifestyles in urban systems is of practical relevance, as the optimization of efficient technologies alone will not be enough to achieve a degree of environmental protection that maintains world's capacities. Since a sustainable development depends on and influences the psychological and sociological matrix of HES, it is important to integrate the views of different stakeholder groups into urban planning. An understanding of the views of different stakeholder groups can aid urban planning to realize a sustainable transition of urban systems.

The research question of this thesis is to create theoretical and empirical evidence in lifestyles in order to enable science and practice to plan a sustainable urban development that is successful in a market economy. Firstly, theoretical evidence is embedded into an interdisciplinary framework of HES. Secondly, empirical evidence is presented from two studies on the views of different stakeholder groups.

This cumulative thesis consists of three related contributions: The first contribution provides a review of lifestyle research. It contributes to the critical question of how the buzzword "lifestyle" can be transformed into a scientific concept that can be used for science and practice on sustainable urban living. The second contribution provides a study of sustainability criteria that key financial stakeholders regard as important for the market success of sustainable real estate funds (S-REFs), and how they assess the market acceptance of such funds. The third contribution provides a scenario assessment of six urban planning scenarios by members of different stakeholder groups in the Canton of Basel-Stadt. It depicts different alternative futures with respect to the sustainability performance of "Erlenmatt", a major urban redevelopment project in the Canton of Basel-Stadt. The case study area comprises 19.2

hectares composed of about eight hectares of parkways, public spaces, and a conservation area. Erlenmatt, a mixed-usage district with about 700 apartments for 1,800-2,000 inhabitants and 1,100-2,000 working places on 10 building plots, will be developed during the next 15-20 years.

The empirical studies were conducted in the German-speaking parts of Switzerland. The views of housing suppliers, the non-profit & public sector, and housing target groups were studied (n = 182). Housing suppliers were investors, principals, real estate fund (REF) suppliers, project developers, responsible experts and architects. The non-profit & public sector consisted of planning administrators and representatives of sustainability non-governmental organizations (NGOs). Housing target groups were parents of young families and life science personnel with a modern orientation.

The first contribution provided a lifestyle definition that is based on an interdisciplinary review of psychological and sociological lifestyle research. The lifestyle definition is based on the Lewinian field theory and HES. Lifestyles are patterns of thinking and behaviour with habitual and self-identificatory potential, through which individuals express social affiliation and distinction. The second contribution found that S-REFs serve as a responsible property investment that foster the expression of sustainable lifestyles. The contribution identified sustainability criteria and drivers for key financial stakeholders' market acceptance of S-REFs. The third contribution found that more sustainable scenarios for the case study (Erlenmatt) are preferred with respect to desirability and utility, and that their probability is not estimated lower than other scenarios. The non-profit & public sector is most pessimistic about the probability of a sustainable district, whilst housing suppliers desire it less.

The results suggest that stakeholder groups have to realize transitions for urban lifestyles and efficient technologies that perform well, create consent, and are successful in a market economy. Lifestyles provide incentives and barriers for regulating urban systems, and give in-depth information for their sustainable transition. Such a transition of urban systems requires the sustainable development of coupled HES. Real estate finance instruments and planning options, which foster a sustainable development, have to be assessed by different stakeholder groups using different assessment indicators. The aim is to choose an optimal strategy for implementation, which is thoroughly assessed as well as broadly accepted by different stakeholder groups.

Zusammenfassung

Drei Stränge der Lebensstilforschung können über den Verlauf von mehr als hundert Jahren identifiziert werden: Konsum-, Gesundheits- und Wohnlebensstile. Diese traditionellen Stränge der Lebensstilforschung wurden in verschiedenen wissenschaftlichen Disziplinen wie Psychologie, Soziologie, Wirtschaftswissenschaften, Medizin, Stadtforschung und Umweltwissenschaften untersucht. Lebensstile wurden jedoch nicht sehr eingehend von einer interdisziplinären und transdisziplinären Nachhaltigkeitsperspektive auf Mensch-Umwelt-Systeme (MUS) erforscht. Nachhaltige Lebensstile in Stadtsystemen zu fördern ist von praktischer Relevanz. Die Optimierung effizienter Technologien alleine wird nicht ausreichen, um einen Grad an Umweltschutz zu erreichen, der die Tragfähigkeit der Erde aufrecht erhält. Da eine nachhaltige Entwicklung von der psychologischen und soziologischen Matrix von MUS abhängt und diese beeinflusst, ist es von Bedeutung, die Ansichten verschiedener Interessengruppen in die Stadtplanung einzubinden. Ein Verständnis, welche Ansichten verschiedene Interessengruppen über Lebensstile haben, kann der Stadtplanung bei der nachhaltigen Umwandlung von Stadtsystemen helfen.

Die Forschungsfrage dieser Arbeit ist theoretische und praktische Belege über Lebensstile zu finden um es Wissenschaft und Praxis zu ermöglichen eine nachhaltige Stadtentwicklung zu planen, die in einer Marktwirtschaft erfolgreich ist. Erstens wird das Lebensstil-Konzept theoretisch in einen interdisziplinären Rahmen von MUS eingebettet. Zweitens werden empirische Belege aus zwei Untersuchungen über die Ansichten verschiedener Interessengruppen präsentiert.

Diese kumulative These besteht aus drei aufeinander bezogenen Beiträgen: Der erste Beitrag liefert eine Literaturübersicht zur Lebensstilforschung. Er trägt zur kritischen Frage bei, wie das Modewort „Lebensstil“ in ein wissenschaftliches Konzept umgeformt werden kann, das für die Wissenschaft und Praxis nachhaltigen Stadtlebens verwendet werden kann. Der zweite Beitrag liefert eine Studie über die Nachhaltigkeitskriterien, die Schlüsselfinanzakteure als wichtig für den Markterfolg von Nachhaltigen Immobilienfonds (NIFs) erachten, und wie sie die Marktakzeptanz solcher Fonds bewerten. Der dritte Beitrag liefert eine Szenariobewertung von sechs Stadtplanungsszenarien durch Mitglieder verschiedener Interessengruppen des Kantons Basel-Stadt. Er zeigt unterschiedliche alternative Zukünfte in Bezug auf die

Nachhaltigkeitsleistung der „Erlenmatt“, einem größeren städtischen Umnutzungsprojekt im Kanton Basel-Stadt. Das Fallstudienareal umfasst 19,2 Hektar, davon etwa acht Hektar Parkanlagen, öffentliche Plätze und ein Naturschutzgebiet. Die Erlenmatt, ein gemischt genutztes Quartier mit etwa 700 Wohnungen für 1.800-2.000 Einwohner und 1.100-2.000 Arbeitsplätze auf 10 Baufeldern, wird im Verlauf der nächsten 15-20 Jahre entwickelt.

Die empirischen Studien wurden in der deutschsprachigen Schweiz durchgeführt. Es wurden die Ansichten von Wohnanbietern, des gemeinnützigen & öffentlichen Sektors und von Bewohnerzielgruppen untersucht (n = 182). Wohnanbieter waren Investoren, Bauherren, Immobilienfondsanbieter, Projektentwickler, verantwortliche Fachpersonen und Architekten. Der gemeinnützige & öffentliche Sektor bestand aus Planungsbeauftragten und Vertretern von nachhaltigen Nichtregierungsorganisationen (NROs). Bewohnerzielgruppen waren Eltern von jungen Familien und Lebenswissenschaftspersonal mit einer modernen Grundorientierung.

Der erste Beitrag lieferte eine Lebensstildefinition, die auf einem interdisziplinären Literaturüberblick der psychologischen und soziologischen Lebensstilforschung basiert. Die Lebensstildefinition basiert auf der Lewin’schen Feldtheorie und MUS. Lebensstile sind Denk- und Verhaltensmuster mit Gewohnheits- und Selbstidentifikationspotenzial, durch die Personen soziale Zugehörigkeit und Abgrenzung ausdrücken. Der zweite Beitrag fand, dass NIFs als verantwortliche Immobiliengeldanlage dienen, die den Ausdruck nachhaltiger Lebensstile fördern. Der Beitrag identifizierte Nachhaltigkeitskriterien und Treiber für die Marktakzeptanz von NIFs durch Schlüsselfinanzakteure. Der dritte Beitrag fand, dass nachhaltige Szenarien für die Fallstudie (Erlenmatt) in Bezug auf Erwünschtheit und Nutzen bevorzugt werden, und dass ihre Wahrscheinlichkeit nicht niedriger als die anderer Szenarien eingeschätzt wird. Der gemeinnützige & öffentliche Sektor ist über die Wahrscheinlichkeit eines nachhaltigen Quartiers am pessimistischsten, während Wohnanbieter es weniger wünschen.

Die Ergebnisse deuten darauf hin, dass Interessengruppen die Umwandlung städtischer Lebensstile und effizienter Technologien verwirklichen müssen, die gut abschneiden, Konsens bilden und marktwirtschaftlich erfolgreich sind. Lebensstile schaffen Anreize und Barrieren für die Regulation von Stadtsystemen und geben eingehende Information für ihre nachhaltige Umwandlung. Eine solche Umwandlung von Stadtsystemen erfordert eine nachhaltige Entwicklung von gekoppelten MUS. Immobilienfinanzinstrumente und Planungsoptionen, die eine nachhaltige Entwicklung fördern, müssen von verschiedenen Interessengruppen unter Verwendung von verschiedenen Bewertungsindikatoren bewertet werden. Das Ziel ist eine optimale Implementierungsstrategie zu wählen, die von verschiedenen Interessengruppen sowohl gründlich bewertet als auch breit akzeptiert wird.

Table of contents

Acknowledgements **v**

Abstract **vii**

Zusammenfassung **ix**

Table of contents **xi**

List of figures **xvii**

List of tables **xix**

List of acronyms **xxi**

1 Introduction: An overview of the thesis **1**

1.1 Framework: Research motivation and objectives 1

1.1.1 Human-environment systems: Combining two sides of the coin for an enhanced sustainability of urban systems 2

1.1.2 Interdisciplinarity: Combining different disciplines for an enhanced understanding of lifestyles 3

1.1.3 Transdisciplinarity: Combining science and practice communities for joint problem-solving on an equal footing 6

1.2 Lifestyle research 7

1.2.1 Basic ideas of lifestyle research 7

1.2.2 Disciplinary roadmap of lifestyle research 8

1.2.3 Traditional strands of lifestyle research 10

1.3 Defining the field of study: Concepts and definitions 11

1.3.1 Sustainable development 11

1.3.2 Property investment 13

1.3.3 Stakeholder 13

1.4 Research plan 15

1.4.1 Research gaps and expected added value 15

1.4.2 Research questions and hypotheses 17

1.4.3 Research contributions 17

1.5 Case description 18

1.5.1 Switzerland 18
1.5.2 Canton of Basel-Stadt 21
1.5.3 Erlenmatt 23
1.6 References 24
Endnotes 30

2 What can we learn from lifestyle research for sustainable urban living? 31
Abstract 31
2.1 Introduction 32
2.1.1 Overview on traditional strands of lifestyle research 32
2.1.2 The application of lifestyles for sustainable urban development 34
2.2 The actualization of lifestyles in urban systems 36
2.2.1 Human matrix 39
2.2.1.1 Cognitive-behavioral submatrix 39
2.2.1.2 Socio-demographic submatrix 42
2.2.2 Environmental matrix 43
2.2.2.1 Situational submatrix 43
2.2.2.2 Socio-cultural submatrix 46
2.3 The motivational role of lifestyles for human self-regulation 48
2.4 Discussion 51
2.5 Conclusion 52
2.6 Acknowledgements 53
2.7 References 53

3 Sustainable property funds: financial stakeholders' views on sustainability criteria and market acceptance 65
Abstract 65
3.1 Introduction 66
3.2 Research objectives and hypotheses 68
3.2.1 Anticipated importance of sustainability criteria 69
3.2.2 Predictors for market acceptance: cognitive drivers 69

3.2.3 Predictors for market acceptance: institutional context 71
3.3 Methods 71
3.3.1 Focus groups 71
3.3.2 Questionnaire study 72
3.3.3 Model variables 73
3.3.3.1 Dependent regression variables 73
3.3.3.2 Independent regression variables 74
3.3.4 Data analyses 75
3.3.4.1 Factor analysis 75
3.3.4.2 Regression analyses 76
3.4 Results 76
3.4.1 Key financial stakeholders' views on sustainability criteria for REFs 76
3.4.2 Fund strategy and target group of S-REFs 78
3.4.3 Market acceptance by key financial stakeholders 81
3.4.3.1 Behavioural finance aspects of investors' market acceptance of S-REFs 81
3.4.3.2 Cognitive drivers for institutional investors' market acceptance of S-REFs 81
3.4.3.3 Institutional predictors for institutional investors' market acceptance of S-REFs 83
3.4.3.4 Socio-demographic controls for institutional investors' market acceptance of S-REFs 83
3.4.3.5 Behavioural finance aspects of funds suppliers' market acceptance of S-REFs 83
3.5 Discussion 84
3.5.1 Accepted sustainability criteria for REFs 84
3.5.2 The role of sustainable social infrastructure for REFs 85
3.5.3 Market acceptance of S-REFs 86
3.5.3.1 Cognitive drivers of investors' market acceptance 87
3.5.3.2 Institutional context of investors' market acceptance 89
3.5.3.3 Socio-demographic controls of investors' market acceptance 89

3.5.4 Differences from an international perspective 90
3.5.5 Limitations of the study 91
3.6 Conclusions 92
3.7 Acknowledgements 93
3.8 References 93
Endnote 101

4 Identifying stakeholders' views on sustainable urban transition: desirability, utility and probability assessments of scenarios 102
Abstract 102
4.1 Introduction 103
4.1.1 Detailed individual assessment 105
4.1.2 Social conflict analysis 106
4.2 Methods 107
4.2.1 Description of the case study 107
4.2.2 Sample description 109
4.2.3 Scenario construction 109
4.2.4 Scenario assessment 112
4.2.5 Data analyses 113
4.3 Results 114
4.3.1 Detailed individual assessment 114
4.3.1.1 Sustainability hypothesis 114
4.3.1.2 Cognitive system hypothesis 116
4.3.2 Social conflict analysis 117
4.3.2.1 Dissent hypothesis 117
4.3.2.2 Optimal solution hypothesis 118
4.4 Discussion 119
4.4.1 Detailed individual assessment 119
4.4.2 Social conflict analysis 120
4.4.3 Outlook on the case study 121
4.4.4 Limitations of the study 121
4.5 Conclusions 122

4.6 Acknowledgements 123
4.7 References 123

5 Concluding remarks 129
5.1 Summary of results: Main insights from the studies 129
5.1.1 Urban and housing studies 129
5.1.2 Sustainable property investment 130
5.1.3 Lifestyles and sustainable urban development 133
5.2 Theoretical and methodological conclusions 133
5.2.1 Theoretical conclusions 133
5.2.2 Methodological conclusions 135
5.2.2.1 Two-step study: Sustainability criteria and market acceptance of S-REFs 135
5.2.2.2 Scenario assessment: Erlenmatt Exploration Parcours 136
5.3 Relevance of the results 137
5.3.1 Scientific relevance 137
5.3.1 Practical relevance 138
5.4 Outlook 140
5.5 References 140

Appendix A: Additional publications and presentations
Appendix B: Curriculum vitae

List of figures

Figure 1.1 Human-environment system (HES) postulates in the HES framework 4
Figure 1.2 Research logic of the thesis 12
Figure 1.3 Sample description 22
Figure 1.4 Total real estate value in Switzerland 22
Figure 2.1 Fields of transition in urban systems by traditional lines of lifestyle research 35
Figure 2.2 Process-structure model of lifestyle settings in human-environment systems 38
Figure 2.3 Decision and motivational action cycle model with lifestyles as an attractor and evaluator 49
Figure 3.1 Procedure of the study - basic modules 69
Figure 3.2 Overview on the anticipated importance of sustainability criteria for the market success of sustainable real estate funds 79
Figure 4.1 Location, building plots, green spaces and infrastructure measures 108
Figure 4.2 Detailed individual assessment: mean values of desirability vs. probability assessments (all stakeholders) 115
Figure 4.3 Difference between analytic (utility) and intuitive (desirability) assessment of urban planning scenarios (all stakeholders) 116
Figure 4.4 Social conflict analysis: mean values of desirability vs. probability assessments (by stakeholder groups) 118

List of tables

Table 1.1 Human-environment system (HES) postulates 3
Table 1.2 Research questions and hypotheses 19
Table 1.3 Objectives, methods and respondent groups of the research contributions 20
Table 3.1 Description of hypotheses 70
Table 3.2 Mean shares of capital investment categories as of 31December 2005 with reference to assets under management 75
Table 3.3 Proposed weights of sustainability criteria and direct real estate investment categories for designing a sustainable real estate fund 80
Table 3.4 Summary of regression analyses for the market acceptance of sustainable real estate funds by institutional real estate investors 82
Table 4.1 Site development of Erlenmatt: summary of capacity and type of usage 107
Table 4.2 Urban planning scenarios: summary of scenario construction 111
Table 4.3 Analytical assessment of utility: summary of sustainability criteria 113

List of acronyms

A	Action
AG	Aktiengesellschaft (Joint stock company)
ANOVA	Analysis of variance
ARE	Bundesamt für Raumentwicklung (Federal Office for Spatial Development)
b	Regression coefficient
bio.	Billion
BRE	Building Research Establishment Ltd.
BREEAM	BRE Environmental Assessment Method
BVG	Bundesgesetz über die berufliche Alters-, Hinterlassenen- und Invalidenvorsorge (Systematische Rechtssammlung [SR] 831.40) (Swiss Federal Law on Occupational Retirement, Survivors' and Disability Pension Plans [Classified Compilation of Federal Legislation No. 831.40])
BVV2	Verordnung über die berufliche Alters-, Hinterlassenen- und Invalidenvorsorge (Systematische Rechtssammlung [SR] 831.441.1) (Ordinance on Occupational Retirement, Survivors' and Disability Pension Plans [Classified Compilation of Federal Legislation No. 831.441.1])
cf.	Confer (compare)
CHF	Swiss francs
CMS	Christoph Merian Stiftung (Christoph Merian Foundation)
CO_2	Carbon dioxide
CS	Credit Suisse
D, d	Decision, Drive, Desirability
DB	Deutsche Bahn (German Railways Company)
DCF	Discounted cash-flow
DGNB	Deutsche Gesellschaft für Nachhaltiges Bauen (German Sustainable Building Council)
E	Reaction-evocation potential, Environmental matrix, Environmental reaction, East
∈	Element
Ed., ed	Editor

Edn., edn	Edition
Eds., eds	Editors
e.g.	Exempli gratia (for example)
ELCA	Exergetic life-cycle assessment
EP	Exploration Parcours
ERES	European Real Estate Society
Eurostat	Statistical Office of the European Communities
et al.	et alii (and others)
ETHZ	Eidgenössische Technische Hochschule Zürich (Swiss Federal Institute of Technology Zurich)
expect.	Expectedly
F	Test statistic of the Fisher-Snedecor distribution
f	Function
GDP	Gross domestic product
GFA	Gross floor area
GmbH	Gesellschaft mit beschränkter Haftung (company with limited liability)
H	Habit, Hypothesis, Human matrix, Human reaction
H x E	Human-environment matrix
HES	Human-environment systems
HS	Housing suppliers
HTG	Housing target groups
i.e.	Id est (that is)
IED	Institute of Environmental Decisions
IIED	International Institute for Environment and Development
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
km	Kilometres
km^2	Square kilometres
L	Lifestyle
LCIA	Life cycle impact assessment
LCA	Life cycle assessment
LEED	Leadership in Energy and Environmental Design

m^2	Square metres
max.	maximal
MUS	Mensch-Umwelt-System (human-environment system)
N	North
n	Sample size
NIF	Nachhaltiger Immobilienfonds (sustainable real estate fund)
NGO	Non-governmental organization
No.	Numero (number)
NPPS	Non-profit & public sector
NRO	Nichtregierungsorganisation (non-governmental organization)
NRP	National Research Programme
NSSI	Natural and Social Science Interface
NUTS	Nomenclature of Territorial Units for Statistics
NYSE	New York Stock Exchange
P, p	Postulate, Probability
p.	Pagina (page)
PC	Project coverage
PD-BS	Präsidialdepartement des Kantons Basel-Stadt (Departement of Presidential Affairs of the Canton of Basel-Stadt)
Ph.D.	Philosophiae doctor (doctor of philosophy)
pp.	Paginae (pages)
PR	Participation rate
PRI	Principles for responsible investment
R	Response, Reward
r	Correlation coefficient
R^2	Coefficient of determination
REF	Real estate fund
REIT	Real estate investment trust
RR	Response rate
RR-BS	Regierungsrat des Kantons Basel-Stadt
S, s	Stimulus, Strategy, South
SFA	Swiss Funds Association
S-REF	Sustainable real estate fund

SD	Standard deviation
SE	Standard error
SFSO	Swiss Federal Statistical Office
SIA	Schweizerischer Ingenieur- und Architektenverein (Swiss Association of Engineers and Architects)
SIA 112/1	Schweizerischer Ingenieur- und Architektenverein Empfehlung 112/1 Nachhaltiges Bauen - Hochbau (Swiss Association of Engineers and Architects Recommendation 112/1 Sustainable construction – Building construction)
SNB	Swiss National Bank
SNSF	Swiss National Science Foundation
SPSS	Statistical Package for the Social Sciences
S-R	Stimulus-response
SRI	Socially responsible investment
Stata/SE	Stata/SpecialEdition
STEP IAK	Stadtteilentwicklungsplan Integrale Aufwertung Kleinbasel (Urban District Development Plan for the Integrative Revaluation of Kleinbasel)
Suppl.	Supplement
SWX	Swiss Exchange
t, T	Time, Test statistic of Student's t distribution
TEB	Trinational Eurodistrict Basel
U, u	Utility
UBS	Union de Banques Suisses
UN	United Nations
UNEP	United Nations Environment Programme
UNEP FI	UNEP Finance Initiative
UNFPA	United Nations Population Fund
U.S./US	United States
US$	United States dollar
U.S. HHS	U.S. Departement of Health and Human Services
UZH	University of Zurich
Vivico	Vivico Real Estate GmbH
Vol./vol	Volume
vs.	versus (against)

W	West
WBCSD	World Business Council for Sustainable Development
WCED	World Commission on Environment and Development
z	Standard score of the normal distribution

1 Introduction: An overview of the thesis

1.1 Framework: Research motivation and objectives

The built environment consists of all man-made environmental structures that provide a setting for the activities of humans and the environment. A sustainable development of the built environment is a multi-faceted challenge for science and practice. The built environment causes a multitude of environmental impacts, such as greenhouse gas emissions, soil sealing, loss of biodiversity, and pollution (Mackley, 2001). At the same time, as Mackley (2001) argues, the constructed facilities of the built environment are humankind's most important economic, social, and environmental investment. This insight has been shared by several generations of built environment researchers.

From the "green building" movement in the 1970s onward, built environment researchers have become more and more aware that the sustainable design of buildings contributes much to save the world's capacities. The green building movement focused on energy efficiency and ecological sustainability. Later, the Brundtland report showed that sustainable development is a pattern of resource that seeks to preserve the environment while aiming to meet the human needs of present and future generations. Accordingly, the concept of sustainable development was introduced that meets the needs of the present without compromising the ability of future generations to meet their own needs (United Nations (UN), 1987). The Brundtland report enlarged the view of sustainability, expanding it from ecological to social and economic sustainability. Eventually, this brought a fundamental change in built environment research - from the green building movement towards a "sustainable building" movement that fosters not only ecological, but also social and economic goals of sustainability.

These insights guided the sustainable building movement to design a multitude of building certification systems and standards.[1] These building certification systems and -standards

largely concentrate on the technological design of buildings, which affects the ecological performance of building projects, but include social and economic components only at the margins. During their last revisions, however, some of these building certification systems and -standards began to integrate more social and economic components of sustainability. Nevertheless, this concentration still neglects the sustainability of dwellers' lifestyles, and the ability of stakeholder groups to influence such lifestyles by an appropriate sustainability design for the built environment. Accordingly, it is important to investigate the lifestyle concepts of these stakeholders to promote a sustainable urban development. The Swiss National Science Foundation (SNSF) recognized this need and set up National Research Programme (NRP) 54 to study how a sustainable development of the built environment can take place (cf. SNSF, 2010). The investigation of lifestyles and property investment were among the challenges to achieving a more sustainable development. These efforts broadened the perspective of the building community from technological design to social and economic sustainability of built environments.

A core assumption of this thesis is that an investigation of lifestyles can benefit from a framework of human-environment systems, which draws on natural and social sciences and a science-practice dialogue. This thesis draws upon three *research motivations* to broaden the frontiers of lifestyle research in urban planning: (1) a better understanding of lifestyles in human-environment systems, (2) an enrichment of lifestyle research from an interdisciplinary perspective, and (3) a transdisciplinary perspective on lifestyles that improves the design of future urban districts. These research motivations concentrate on the views of different stakeholder groups regarding sustainability investments in the built environment. Such investments can foster the sustainability of building projects, urban districts, cities, or city regions.

1.1.1 Human-environment systems: Combining two sides of the coin for an enhanced sustainability of urban systems

A sustainable development depends on the processes and structures learned from human-environment systems (HES) research (Scholz, 2011). HES research is structured along the HES postulates (cf. Table 1.1) and the HES framework (cf. Figure 1.1).[2] The HES postulates

Table 1.1 Human-environment system (HES) postulates

Number	Label	Contents
P1	Complementarity	Human and environmental systems are complementary.
P2	Hierarchy	Human and environmental systems both have hierarchical structures.
P3	Interference	There are disruptive interactions among and within different levels of human and environmental systems, in particular between the micro and macro level.
P4	Feedback	There are different types of feedback loops within and between human and environmental systems.
P5	Decision	Human systems can be conceived as decision makers who have drivers and who act to satisfy goals.
P6	Awareness	Human systems have different types of environmental awareness.
P7	Environment-first	The effective analysis of inextricably coupled human and environmental systems, as well as the planning for sustainable human-environment interactions, requires a thorough analysis of the material and social environment which builds the matrix of human-environment systems.

Note: Adapted from Scholz (2011).

serve as key principles for the structure and process of environmental problem-solving (cf. Scholz, 2011). The HES framework is a practical way to reduce the complexity of human-environment relationships to processes and structures (Scholz, 2011). The human-environment system (HES) postulates, highlighted by numbers in the HES framework, serve as key principles for environmental problem-solving (cf. Figure 1.1). The HES framework is used as a template for this thesis to structure lifestyle research.

1.1.2 Interdisciplinarity: Combining different disciplines for an enhanced understanding of lifestyles

Interdisciplinarity refers to a field of study that crosses traditional boundaries between academic disciplines or schools of thought. Interdisciplinary research is an academic process that seeks to synthesize broad perspectives, knowledge, skills, interconnections, and epistemology between different disciplines. Interdisciplinarity may be founded to facilitate the study of subjects that cannot be understood from a single disciplinary perspective. For this reason, cultivating interdisciplinarity is a habit of science striving for an informed and engaged education of researchers in the sense of a “disciplined interdisciplinarity”. As Scholz (2011) showed, such a disciplined interdisciplinarity, which draws from multiple academic

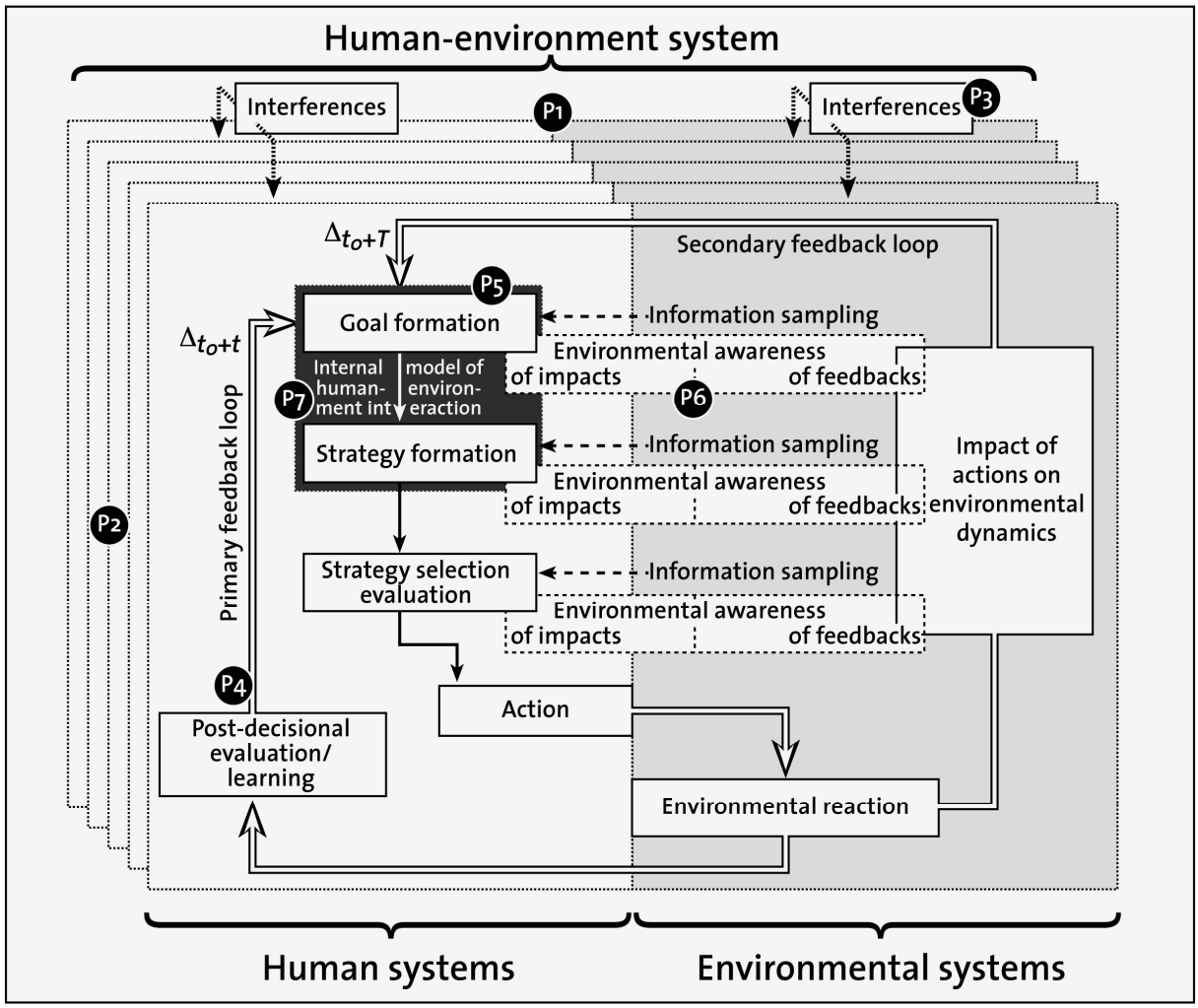


Figure 1.1 Human-environment system (HES) postulates in the HES framework

Note: Adapted from Scholz, Binder and Lang (2011).

sources, makes people more capable of analyzing, assessing, and synthesizing information to render rational decisions that help science and society to advance.

In this thesis, six different academic disciplines are used to approach the study of lifestyles. Three academic disciplines come from the social sciences (psychology, sociology, and economics), and three come from the natural sciences (medicine, urban studies, and environmental sciences). As disciplinary interfaces become more and more permeable today, the study of human-environment systems is present in all of these academic disciplines.

1) *Psychology*: Psychology is the science of human thinking and behaviour. Its traditional areas of research have included drivers of behaviour such as preferences, utilities, drives, needs, emotions, cognitions, motives, values, norms, and attitudes (Scholz, 2011). Three

of its focuses, *cognitive psychology*, *social psychology* and *environmental psychology*, appear in this thesis. Cognitive psychology explores the mental processes of the human mind related to decision-making. Social psychology explores the influence of the actual or imagined presence of others on people's thoughts, feelings, and behaviours. Environmental psychology is an interdisciplinary interface combining psychology and the environmental sciences that focuses on the mutual dependency of humans and their environment. These focuses of psychology are important for lifestyle research, as they integrate the mechanisms of the human mind with its natural, social and built environment.

2) *Sociology*: Sociology is the science of human societies and their societal structures. Its traditional areas of research have included drivers of human systems such as individuals, groups, organizations, companies, communities, societies, and supranational institutions (Scholz, 2011). Four of its focuses, *social structure*, *socio-culture*, *social milieu*, and *social infrastructure*, appear in this thesis. Social structure is the socio-demographic stratification of a human system. Socio-culture comprises the culturally transmitted social structures, networks, and communication systems that affect individuals and their social processes (Bourdieu, 2007). The social milieu is the social environment in which an individual lives. Social infrastructure is the services that enable people to develop, maintain and change their practiced and desired lifestyles and social networks in a community. These focuses of sociology are important for lifestyle research, as they integrate the actualization of lifestyle with the sociology of human systems.

3) *Economics*: Economics is the science of the production, distribution, and consumption of goods and services (Scholz, 2011). Its traditional areas of research have included drivers of economic systems such as micro-economics, which examines the behaviour of markets and agents, and macro-economics, which addresses national or supranational economies. One of its micro-economy focuses, *behavioural economics*, which is tightly related to psychology, appears in this thesis. Behavioural economics investigates how stakeholders think and behave in the market. This focus of economy is important for lifestyle research, as the drivers of economic decisions shape the expression of our lifestyles.

4) *Medicine*: Medicine is the science of healing humans. Its traditional areas of research have included drivers of health and disease. Two of its focuses, *health care* and

public health, appear in this thesis. Health care is the prevention and treatment of illness. Public health is concerned with the health of the community as a whole and fulfils society's interest in assuring conditions in which people can be healthy. These focuses of medicine are important for lifestyle research, as health behaviour shapes our health status, which in turn feeds back to the expression of well-being and satisfaction.

5) *Urban studies*: Urban studies focus on the science of urban systems, including aspects of urban districts, cities, and their suburbs. Urban systems exist at several scales and can include individual urban settlements or networks of such settlements. Two traditional areas of research, *urban planning* and *housing studies*, appear in this thesis. Urban planning tries to realize transitions to improve the environment of urban systems. Housing studies are concerned with the shelter of dwellings and attempts to relate them to both individual and collective levels of social analysis, and to collective spatial units (Kemeny, 1992, p. 164). These focuses of urban studies are important for lifestyle research, as urban planning shapes our lifestyles, and housing is one of the traditional strands in lifestyle research.

6) *Environmental sciences*: Environmental sciences study how the environment works and how human systems interact with the environment (Scholz, 2011). Its traditional areas of research have included drivers of environmental systems such as physics, chemistry, biology, soil science, geology, and geography. Three of its traditional areas of research, *green space design*, *landscape- and natural ecology*, and *ecodesign* appear in this thesis. Green space design is based on the planning of land cover types and ecological habitat. Landscape- and natural ecology seeks to preserve the ecological quality of pristine areas. Ecodesign covers green space design and landscape- and natural ecology for an enhanced environmental quality of areas. These focuses of environmental sciences are important for lifestyle research, as they help to manage transitions of green spaces and coupled human and environmental systems to be more sustainable.

1.1.3 Transdisciplinarity: Combining science and practice communities for joint problem-solving on an equal footing

Collaboration between science and society is often requested if uncertainty arises about substantial changes in the design of human-environment systems (Scholz, 2011). Scholz (2011)

defines transdisciplinarity as a means to cope with complex, ill-defined, contextualized, and socially relevant problems. Transdisciplinarity uses knowledge from science and society, with different epistemics serving societal capacity building. Accordingly, transdisciplinarity is strongly rooted in the transformation of scientific results into policy processes (Scholz, 2011).

Transdisciplinary processes can organize joint problem definition, knowledge integration, mutual sustainability learning and societal capacity building when science and practice collaborate on an equal footing (Scholz, 2011). Such transdisciplinary processes have been successfully applied in several case studies on sustainable urban development (Scholz *et al*., 1996, 1997, 2004, 2005). In one of such case studies, Loukopoulos and Scholz (2004) highlighted the mobility lifestyle preferences of various Swedish stakeholder groups. In another study, Scholz *et al*. (2004) considered how different lifestyles shape mobility patterns and preferences for different types of urban development. In the Canton of Basel-Stadt, lifestyle and sustainable property investment were the focuses of studies on leisure mobility (Scholz *et al*., 2004) and railway stations (Scholz *et al*., 2005). These studies found that leisure and mobility are lifestyle issues on a societal level that influence urban planning. In the aftermath, a need was detected to deepen the knowledge of lifestyles for a sustainable urban development, with the focus on a large urban development area in the Canton of Basel-Stadt (cf. Section 1.5.3 Erlenmatt).

1.2 Lifestyle research

1.2.1 Basic ideas of lifestyle research

Much research in the social sciences focuses on the social structure (e.g., age, sex, and income) of respondents and populations. The shortcomings of such social structure approaches are obvious: Social structure approaches tend to neglect that people think and behave differently, although their social structure may be the same. The core idea of lifestyle theory is therefore that patterns of human thinking and behaviour explain more than social structure alone. That is, social structure contributes to how people behave in urban systems, but so do their lifestyles. A long history of lifestyle research has shown that the key elements of lifestyle are patterns of thinking and behaviour, habits, habitus, and social identity (cf. Chapter 2).

During the course of its history, the lifestyle concept became known in several science and practice communities. Lifestyle entered more and more academic disciplines and traditional strands of lifestyle research. The following sections present a disciplinary roadmap of lifestyle research. It covers psychology, sociology, economics, medicine, urban studies, and environmental sciences, and three traditional strands: consumer, health, and housing lifestyles.

1.2.2 Disciplinary roadmap of lifestyle research

Lifestyle research throughout the past century has more and more become an interdisciplinary field of study. Starting with sociology (Georg Simmel, Émile Durkheim, Max Weber), lifestyle research began to cross over by stimulating individual psychology (Alfred Adler) at the beginning of the 20th century. In the beginning, lifestyle research was a field of study focussed on the social sciences, but later, the lifestyle concept began to cross boundaries into natural sciences. Researchers from these academic disciplines have provided various lifestyle concepts and definitions. Most of these lifestyle concepts have one thing in common: they attempt to define lifestyle by patterns of behaviour to arrive at better explanations of how particular choices come about. The lifestyle concept and its scientific usage have their roots in the sociology and psychology of the late 19th and early 20th century. Since then, many marketing divisions have tried to monopolize “lifestyle” as a unique selling proposition for their products. In particular, for publicity reasons, they changed the meaning of lifestyle to indicate product characteristics that were filled with an emotional benefit.

1) *Psychology* has made substantial contributions to lifestyle research. In cognitive psychology, lifestyles are used to explain decision-making by identifying individual habits, preferences, utilities, drives, needs, emotions, cognitions, motives, values, norms, and attitudes. In social psychology, interpersonal relationships are related to lifestyles, such as social cognitions (Fiske & Taylor, 2008), identifications and social identity (Reitzes, 1986; Tajfel & Turner, 1986), social norms (Dubois, 2003), or symbolic motives (Steg, 2005). In environmental psychology, lifestyles are understood as human conditions, which interact with their context. By doing so, environmental psychology attempts to show how individual behaviour affects and is affected by different environmental conditions (Gifford, 2010).

2) In *sociology*, lifestyles are related to elements of social life such as habitus, the need for distinction, affiliation, social milieu, social structures, and social inequality. Blasius and Winkler (1989) showed that cultural capital differs with the availability of economic capital, but they conclude - in contrast to Bourdieu (2007) - that participation in professional life explains more of the variation in cultural capital than professional position. In a later study, Blasius and Friedrichs (2008) used the lifestyle concept to describe urban living in distressed neighbourhoods, and how gentrification can take place. Georg (1998) provided a socio-structural approach, asking for the relationship of social inequality and the expression of lifestyle. Schulze (2005) showed that, despite an ever-growing individualization, large subcultural groups still exist, which are formed by an orientation towards experience-seeking and new social milieus. These studies showed that lifestyles depend on the habitus, social structure, and social environment.

3) In *economics*, the lifestyle concept is frequently used to identify specific consumer groups for marketing purposes (e.g., Michman, Mazze & Greco, 2003; Vyncke, 2002). The first wave of the lifestyle trend in economics started in the late 1960s and early 1970s (e.g., Green & Wind, 1974, Plummer, 1974; Wells, 1974). Since then, lifestyle has been used in economics to explain consumer behaviour and to plan marketing activities.

4) In *medicine*, lifestyle is used to explain the influence of behaviours on health status and the outbreak of disease (Thirlaway & Upton, 2009). Harmful health behaviours such as drinking, smoking, alcohol abuse, and drug abuse are used to explain the outbreak of disease. There are also protective behaviours such as physical activity, healthy nutrition, and seeking healthy environments that help to preserve health.

5) In *urban studies*, lifestyle is used to explain residential choice and the demand for infrastructure. Much of this research is focused on marketing purposes for investors, rather than on buildings that fit lifestyles. In contrast, transportation and mobility research has begun to understand lifestyle as a factor influencing patterns of transportation demand, but also shaping it (Lyons *et al*., 2002). Mobility lifestyle research has investigated the societal level of social trends, patterns of mobility behaviour and sustainable development (Donaghy *et al*., 2004) as well as the individual level, taking into account values, personality and attitudes toward travel (Choo & Mokhtarian, 2004).

6) In *environmental sciences*, lifestyles are used to explain the influence of behavioural patterns on the natural, built, and social environment. Pioneer works like Sansom's (1976) showed that lifestyles have to be simplified in order to preserve society from wasteful consumption and the destruction of environmental resources. Hofstetter *et al*. (2000) employed the culture-theory approach to show how differing lifestyles lead to various assessments of environmental factors. These studies showed that both technologies and lifestyles are important drivers of urban system dynamics.

The disciplinary roadmap shows evidence that lifestyles depend on different human-environmental system conditions. Accordingly, lifestyle research needs an interdisciplinary perspective from both natural and social sciences to be comprehensive.

1.2.3 Traditional strands of lifestyle research

1) *Consumer lifestyles*: The traditional strand of consumer lifestyles comes mainly from economics, but is also influenced by psychology and sociology. Some argue that the cornerstone of lifestyle is consumption behaviour, which offers people the possibility to individualize the self with goods or services that signal different ways of life (Ropke, 1999). In marketing and communication research, lifestyle is frequently used to identify consumer groups (e.g., Michman, Mazze & Greco, 2003; Vyncke, 2002). From a consumption perspective, three types of sustainable lifestyle have been discussed: McDonald *et al*. (2006) used the "voluntary simplifier lifestyle" of people who can afford a wasteful consumption but voluntarily reject wasting resources. Another type of sustainable lifestyle, the "frugal lifestyle", is characterized by saving money and rejecting material consumption in the purchase and usage of goods and services (Lastovicka *et al*., 1999). A "green lifestyle" means holding beliefs and engaging in consuming fewer resources, and deriving a sense of self from holding such beliefs and engaging in such activities (Rifkin, 1990).

2) *Health lifestyles*: The traditional strand of health lifestyles comes mainly from medicine, but is also influenced by psychology and environmental sciences. A lack of physical activity, unhealthy nutrition, drinking, smoking, illegal drug use, pharmaceutical intake, and stress bring about adverse health consequences in the long run. In an interdisciplinary synthesis, Cockerham (2005) showed that many daily lifestyle practices involve health outcome considerations. An individualist paradigm has influenced concepts of

health lifestyles, but this approach neglects the structural dimensions of such lifestyles. Cockerham (2005) concludes that a theory of health lifestyles is needed that includes both agency and structure, with an emphasis upon restoring structure to its appropriate position.

3) *Housing lifestyles*: The traditional strand of housing lifestyles comes mainly from urban studies, but is also influenced by sociology and environmental sciences. In various Western societies, people express attitudes and behaviours towards sustainability in the pursuit of sustainable lifestyles (Barr & Gilg, 2006). Residential location and consumption of space have entered some consumer-oriented guidebooks that refer to lifestyles (e.g., Wentling, 1990). Lifestyle has also found its way into geography, planning and housing research (Æro, 2006; Blasius & Friedrichs, 2008; Heijs *et al*., 2009). In order to achieve sustainable urban transitions, urban planning has to integrate all evidence from all traditional strands of lifestyle research. Figure 1.2 shows the research logic of this thesis, which is defined by an interdisciplinary and transdisciplinary view of lifestyles in human-environment systems.

1.3 Defining the field of study: Core concepts and definitions

With its focus on lifestyle concepts, this thesis is based on three core concepts that are both inter- and transdisciplinary: sustainable development, property investment, and stakeholders. Each of the core concepts is outlined in the following sections.

1.3.1 Sustainable development

Sustainability covers a multitude of principles, approaches, systems, sub-systems, and policies, which are nested within each other (Glavič & Lukman, 2007). Accordingly, Glavič and Lukman (2007) argue that the multitude of sustainability definitions causes confusion, and that not enough critical attention has been given to the definitions. Although there are several sustainability frameworks for reviewing how a sustainable development comes about, some remain static and focus only on environmental systems instead of the design components of lifestyles. Design components of lifestyles are causes, elements and consequences of patterns of thinking and behaviour that contribute to the processes and structures of human-environment systems. A process-structure model that integrates the design components of lifestyles is however still missing to describe sustainability within the dynamics of coupled human-environment systems.

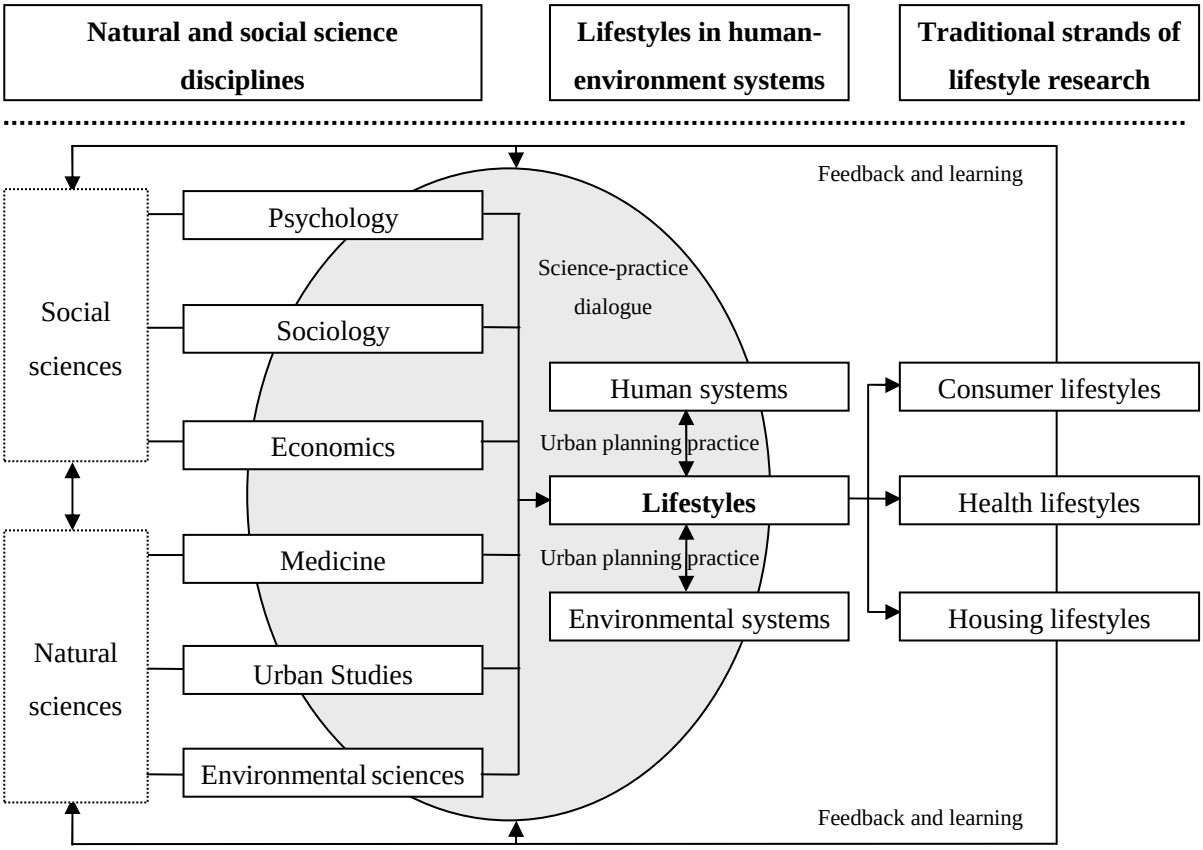


Figure 1.2 Research logic of the thesis

Such a dynamic framework was delivered by Laws *et al*. (2004), who view sustainability as the maintenance of a system within functional limits, an ethical relationship between past and future, and an ongoing inquiry process. They describe a normative pathway of sustainable development that is a dynamic planning approach for a future-oriented society.

A general classification of sustainability is made between strong and weak sustainability. Strong sustainability approaches use flow-based approaches, prioritizing the conservation of natural capital. Weak sustainability approaches use resource-economic approaches, considering possible substitutions of different forms of capital (cf. Häberli *et al*., 2002). Today, a challenge to incorporating sustainability into business strategy is to translate strong sustainability into day-to-day business. Many efforts still rely on environmental assessment methods such as life-cycle, environmental impact, and technology assessments, and material flow analysis. Many environmental assessment methods, however, neglect the influence of lifestyle on achieving strong sustainability.

Sustainable development and sustainability influence many urban planners today (Munier, 2006). Many planners advocate sustainable cities, as they were described in Guy & Marvin (1999). The compact city is presented by many planners as the big idea of sustainable urban development. A sustainable city has also to increase the capability and social equality (Rawls, 1999; Sen, 2001). To achieve a sustainable city, emphasis must be placed on building waste, energy, workplaces, social infrastructure, transportation, cultural heritage, and green- and open spaces. Not only are more sustainable technologies needed to achieve a sustainable city but also sustainable lifestyles. Some planners argue that modern lifestyles are too wasteful. They use too many natural resources, pollute or destroy ecosystems, increase social inequality, create urban heat islands, and cause climate change. Accordingly, more sustainable lifestyles are needed to achieve a sustainable city.

1.3.2 Property investment

Sustainable cities need to consider adequate forms of property investment if they are to become standards in the building sector. Real estate is composed of things that are not movable, such as land and improvements permanently attached to the land (Brueggeman & Fisher, 2010). An investment is the use of financial means for the procurement of tangible, intangible or financial assets (Wöhe & Bilstein, 2002). In finance, an investment means buying securities or other assets. Real estate is such an investment asset with a focus on property. Profitability may, however, not necessarily apply to public or non-profit investors, who expect returns on social or ecological capital. For example, investments made in accordance with sustainable criteria cannot be differentiated from “normal” investments purely in terms of financial return. If environmental indicators and social return are included, however, it makes sense to classify and value sustainable investments separately (Koellner *et al.*, 2005). Property investment can thus be a sustainable investment, if it integrates environmental indicators and social return.

1.3.3 Stakeholder

Stakeholders are natural persons or corporate bodies who are affected by or involved in the decision-making processes of planning and implementing transitions. Stakeholders in the housing market are real estate investors, real estate fund suppliers, project developers,

architects, the non-profit & public sector, housing target groups, and others (cf. Figure 1.3). This thesis concentrates on these stakeholder groups because expert interviews suggested that their activity is dominant for the construction of lifestyles. In addition to these housing market stakeholder groups, there are a variety of other citizen groups and building professionals. Such building professionals may be landowners, principals, building companies, intermediary land agents, banks and financiers, property valuation professionals, planners, responsible experts, lenders, borrowers, sellers, buyers, leasers, or users. It is common in the housing market for some stakeholders to take multiple roles.

A real estate investor is a person or corporate body that uses disposable capital by equity or debt to acquire ownership of land, buildings or civil engineering projects. A real estate investor can be any natural or legal person who buys or owns and develops real estate, expecting a return on capital (Kriese, 2010, p. 2). Some classifications of investors in the housing market distinguish between commercial and non-commercial investors, institutional and private investors, direct and indirect investors, landlord and owner-occupying investors, and short- and long-term investors (e.g., Henderson & Ionnanides, 1983; van Wetzemael, 2005, pp. 90-97; von Thadden, 1995). The empirical studies conducted in this thesis concentrate on the class of institutional investors, as the investment volume necessary for the case study area (Erlenmatt) attracts such investors.

A real estate funds supplier has developed real estate funds and is currently employed supplying or managing real estate funds. Real estate funds are investment fund assets consisting of property. An open real estate fund invests in real estate, and capital can be deposited by every person. A closed real estate fund generally invests in single building projects, and is presented only to selected financiers who are intended to buy at least a predefined sum of fund shares. If the capital needed is deposited, the fund closes; further investments and disbursements are no longer easily possible.

A project developer prepares undeveloped land for construction and coordinates the project development process from the development idea to site selection, planning and building permits, financing, invitation of tenders, allocation, construction, sale or renting (cf. Healey, 1991). A project developer tries to attract investors to a building project, looking to fund the acquisition of the site and the construction work.

An architect is any person who engages in the practice of rendering or offering services for the design and construction, enlargement or alteration of a building project. Although the professional requirements vary by jurisdiction, in most countries an architect must undergo specialized training to earn a license to practice architecture.

The non-profit & public sector consists of representatives of non-government organizations and public administration. Non-government organisations are non-profit, voluntary, self-governing, formally constituted, and organisationally separate from the government (Salamon & Anheier, 1996). Public administration comprises public servants working in public departments and agencies at all levels of government (Kettl & Fesler, 2009).

Housing target groups are potential dwellers of a building project who are intended for measures of marketing communication. They are seeking habitat and have their own needs regarding the supply of dwellings in the built environment.

1.4 Research plan

1.4.1 Research gaps and expected added value

This thesis focuses on gaining a better understanding of lifestyles within the context of sustainable urban living. The research gaps treated in this thesis concern the exploration of sustainable urban lifestyles within human-environment systems, sustainability criteria and market acceptance of sustainable real estate funds (S-REFs), and stakeholders' views on the scenario assessment of a large urban redevelopment area (Erlenmatt).

Social structure approaches as well as lifestyle research have failed to cover some research gaps. Social structure approaches and also lifestyle research tend to neglect the influence of the environmental system in which people live on their thinking and behaviour. Much lifestyle research has neglected the idea that not just parts of the human system, but also the environmental system influences thinking and behaviour. How sustainable urban dwellers live is dependent on personal and environmental factors that comply with processes known from HES research. In addition, much lifestyle research has focused on people's need for distinction as a driver of their social identity, but neglected the need for affiliation. The mutual dependency between identity and everyday life that signals a particular lifestyle has

become blurred in modern society, which is characterized by an ever-growing level of individualization (Giddens, 1991). “Lifestyle” thus has become a buzzword for marketing purposes, signalling a need for distinction expressed by consumer goods. Also, much lifestyle research has focused on patterns of behaviour but neglected patterns of thinking, which are the drivers of behaviour.

All of these research gaps affect the sustainability of urban systems. This thesis tries to close some of these research gaps from an interdisciplinary and transdisciplinary perspective, so that human-environment systems can be planned to be more sustainable. This approach expects added value for different kinds of science and practice:

1) Added value for lifestyle research in sustainable urban systems:
The thesis aims to enrich the interdisciplinary interface of lifestyle research. While much lifestyle research is focused on human systems, many of the environmental properties that shape human decision-making have been neglected. Moreover, the thesis explores human-environment systems of sustainable urban lifestyles that integrate habits, habitus, and the needs for distinction, affiliation and identification within psychology and sociology.

2) Added value for inter- and transdisciplinary research on urban planning:
Lifestyles are crucial for modelling different types of behaviour that are subject to science and practice. The thesis aims to bring lifestyle research to different academic disciplines and urban planning practice. Further benefits are expected for the sustainable development of urban systems, building projects, property investment, and individual behaviour.

3) Added value for psychological research on human-environment systems:
Results from different natural and social sciences are taken into account for putting lifestyle into a decision-theoretic framework of human-environment systems. These results will help explain decision-making processes in property investment and urban planning. The added value lies in understanding the cognitive and institutional drivers of market acceptance of sustainable real estate funds (S-REFs), as well as the presentation of a detailed individual assessment and social conflict analysis of urban planning scenarios.

1.4.2 Research questions and hypotheses

What role do cognitive drivers play for sustainable transitions in housing and infrastructure development that are successful in a market economy? To contribute to the research question of if and how investors construct lifestyles, the research logic of this thesis elaborates on how lifestyles can be understood from an interdisciplinary and transdisciplinary perspective on human-environment systems in order to foster a sustainable urban development. This thesis applies an analysis and classification of the lifestyle concept, an examination of their relevance in specific planning situations, and transdisciplinary support for an urban redevelopment project. The thesis rests on three research contributions: An overview of lifestyle research, an empirical study of sustainable real estate funds, and a scenario assessment of a future urban district. Table 1.2 provides an overview of the research questions and hypotheses of the different contributions.

1.4.3 Research contributions

The thesis consists of three research contributions (cf. Tables 1.2 and 1.3, for an overview):

1) *Lifestyle research*: The contribution provides a theoretical basis for understanding lifestyles in human-environment systems, and prepares the theoretical background in psychology and sociology. A multitude of empirical results from traditional strands of lifestyle research give interdisciplinary evidence for planning sustainable urban transitions of urban systems. It gives a summary of the development and state of traditional lines lifestyle research, and a theoretical preparation of empirical steps in this thesis.

2) *Sustainable real estate funds*: Sustainable real estate funds are a facet of the environmental components that influence lifestyles. Sustainable real estate funds (S-REFs) are as yet vaguely defined, and the market acceptance of such finance instruments is still largely unknown. There is need for sustainable, future-oriented and responsible investments (Wiener, 2006), and to evaluate finance products and risk according to sustainability criteria (Koellner *et al.*, 2005; Weber, Scholz & Michalik, 2010). This contribution provides a catalogue of sustainability criteria for sustainable real estate funds, and evidence for the market acceptance of such funds. The influence of cognitive drivers, institutional context and

socio-demographic controls on decisions to invest, investment volume and acceptance of return shortfalls will be investigated.

3) *Scenario assessment*: Multi-criterion assessments are a component of analytical mediation in area development negotiations (Scholz & Tietje, 2002, Loukopoulos & Scholz, 2004). The contribution includes whether a detailed individual assessment and a social conflict analysis using desirability, utility and probability assessments can inform urban planning.

1.5 Case description

The following section introduces the cases of Switzerland, the Canton of Basel-Stadt, and the Erlenmatt using their property markets, housing conditions and socio-demography.

1.5.1 Switzerland

Switzerland is a federal republic consisting of 26 cantons covering an area of about 41,285 km^2. At the end of 2009, the Swiss population was about 7,79 million people. Switzerland is a landlocked country situated in Central Europe and is one of the richest countries in the world, with a per capita gross domestic product based on current prices of US$69,839 (International Monetary Fund (IMF), 2010). According to the Nomenclature of Territorial Units for Statistics (NUTS), Switzerland is divided into seven regions: Lake Geneva region, Espace Mittelland, North-western Switzerland, Zurich, Eastern Switzerland, Central Switzerland, and Ticino, each with its own history and culture.

Table 1.2 Research questions and hypotheses

Contribution	Research questions	Hypotheses
Lifestyle research	1) What are formal characteristics that differentiate lifestyles, and how are they actualized by lifestyle settings in urban systems?	---
	2) In which pathways of transition can sustainable urban living be promoted by evidence from lifestyle research?	---
	3) Which motivational role do lifestyles play for human decision-making in urban systems?	---
Sustainable real estate funds	1) *Sustainability criteria*: Which sustainability criteria do institutional real estate investors and real estate fund (REF) suppliers regard as important for the market success of S-REFs?	*Social sustainability criteria* (H_1): Whether key financial stakeholders view social sustainability as less important for the market success of sustainable real estate funds than ecological or economic sustainability
	2) *Market acceptance*: How do institutional real estate investors and REF suppliers assess the market acceptance of such funds?	*Sustainability management effect* (H_2): Whether the investors' market acceptance of sustainable real estate funds depends on considering such funds as having positive effects on local and regional development *Risk tolerance* (H_3): Whether the market acceptance of sustainable real estate funds by risk-tolerant investors is higher than for risk-averse investors *Environmentalism* (H_4): Whether environmental anthropocentrism and apathy are negatively related to investors' market acceptance of sustainable real estate funds, whereas ecocentrism is a positive predictor *Institutional context* (H_5): Whether the institutional context (such as assets under management, real estate fund investments, the type of company, and the hierarchical level of investors) is related to the market acceptance of sustainable real estate funds by investors
Scenario assessment	(1) *Detailed individual assessment*: Which stakeholder assessments do urban planning scenarios elicit using a set of criteria and activating different modes of thought?	*Sustainability hypothesis* (H_1): Sustainable scenarios are more preferred and perceived as being as probable as less sustainable scenarios *Cognitive system hypothesis* (H_2): The intuitive assessment (desirability) of a scenario is higher compared than the analytical assessment (utility)
	(2) *Social conflict analysis*: Which differences in the individual assessments of scenarios can be identified between different stakeholder groups?	*Dissent hypothesis* (H_3): Stakeholder groups assess scenarios differently with respect to desirability, utility and probability *Optimal solution hypothesis* (H_4): There are scenarios that are highly desirable and useful for all stakeholder groups, with no substantial dissent between them

Table 1.3 Objectives, methods and respondent groups of the research contributions

Contribution	Objective	Methods	Respondent groups
Lifestyle research	To provide a sound definition of lifestyle based on the psychology and sociology of human-environment systems and traditional strands of lifestyle research	• Literature review	--
Sustainable real estate funds	To elaborate on a catalogue of sustainability criteria for sustainable real estate funds and to give evidence for the market acceptance of such a real estate fund (REF) by key financial stakeholders	• Focus groups • Questionnaire study	• Focus group participants • Institutional investors • REF suppliers
Scenario assessment	To elaborate on the desirability, utility and probability judgements of stakeholders for a detailed individual assessment and a social conflict analysis of urban planning scenarios	• Mental models • Exploration Parcours	• Housing suppliers • Non-profit & public sector • Housing target groups

Note: The study on mental models covered principals and responsible experts in a pre-study for the construction of urban planning scenarios, which were presented in the Exploration Parcours.

Switzerland has a long historical background in common with the traditional establishment of the Swiss Confederation dating back to August 01, 1291. A majority of the Swiss population shares cultural values such as self-determination, neutrality, federalism, direct democracy, collegial decision-making, and sustainable development. The Federal Constitution of the Swiss Confederation underwent a revision in 1999 to embrace the principle of sustainable development. To date, Switzerland neither belongs to the European Union nor the European Economic Area.

There are about 2.5 million buildings in Switzerland. The total real estate value in the country is about 1,890 billion (bio.) CHF, which equals about 1,436 bio. US$ (Graf, 2008; Wüest & Partner, 2006). This total real estate value equals about factor four of the Swiss gross domestic product (GDP) and factor two of the stock market capitalization in Switzerland (Graf, 2008). Figure 1.4 gives an overview on the total real estate value in Switzerland by building function.

1.5.2 Canton of Basel-Stadt

Basel is Switzerland's third most populous city with about 190,000 inhabitants (Statistisches Amt des Kantons Basel-Stadt, 2010). Basel is divided into two demi-cantons: the Canton of Basel-Stadt, and the Canton of Basel-Landschaft. The Canton of Basel-Stadt covers an area of about 37 km^2, consisting of the city of Basel and three rural communities. The city of Basel is located in north-western Switzerland, where the Swiss, French and German borders meet, and on the river Rhine. Basel is a major industrial centre for the life science industry, banking, machinery, construction, and the import-export trade. German is the official language, but 30% of the population are not Swiss citizens.[3] There has been a timely exodus of young families, well-earning executives and under-privileged citizens to adjacent cantons.

The urban redevelopment area (Erlenmatt) lies in the core of Kleinbasel, the urban area of Basel on the right side the river Rhine. Kleinbasel covers about 7.55 km^2, about a third of the city area, and holds a fourth of the cantonal population (Moll, 2006). With its Rhine port, industrial section, and international life science companies, Kleinbasel was the historical north bank for poor people, workers, and migrants. There is a high rate of building vacancy, and unemployment, and, with about 6,300 inhabitants per km^2, a very dense population (Regierungsrat des Kantons Basel-Stadt (RR-BS), 2010).

Degraded neighbourhoods, an unfavourable housing image, a need for housing renovation, and few free and green spaces prevail in Kleinbasel (RR-BS, 2004). The building stock in Basel urgently needs a technical-structural retrofitting. Many homes do not meet today's demand for bigger accommodations, big balconies, friendly bathrooms, modern kitchens and larger and more rooms. Accordingly, a backlog in construction, renovation, and larger homes has resulted in a sustainability report and programmes for district revaluation and new housing stock.[4]

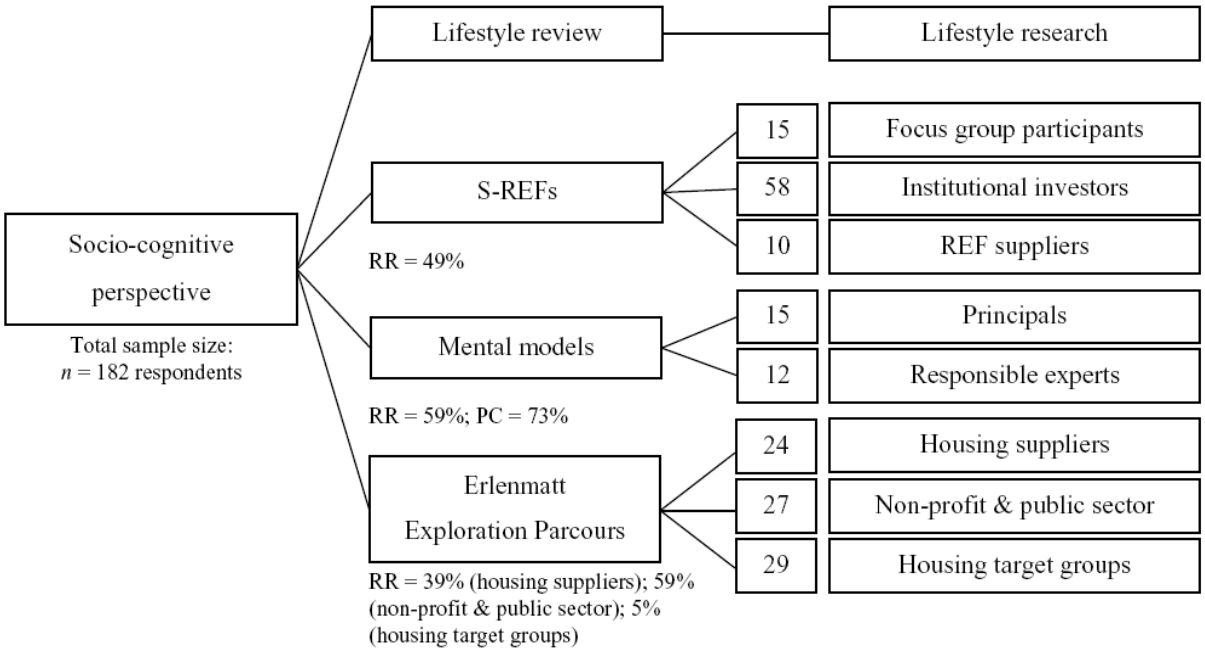


Figure 1.3 Sample description

Note: Double roles are possible. Total sample size is adjusted for 8 double respondents. REF: real estate fund. RR: response rate. PC: Project coverage. Within the scope of this thesis and among other sources, the results generated by the study on mental models were used for the scenario construction of the Exploration Parcours.

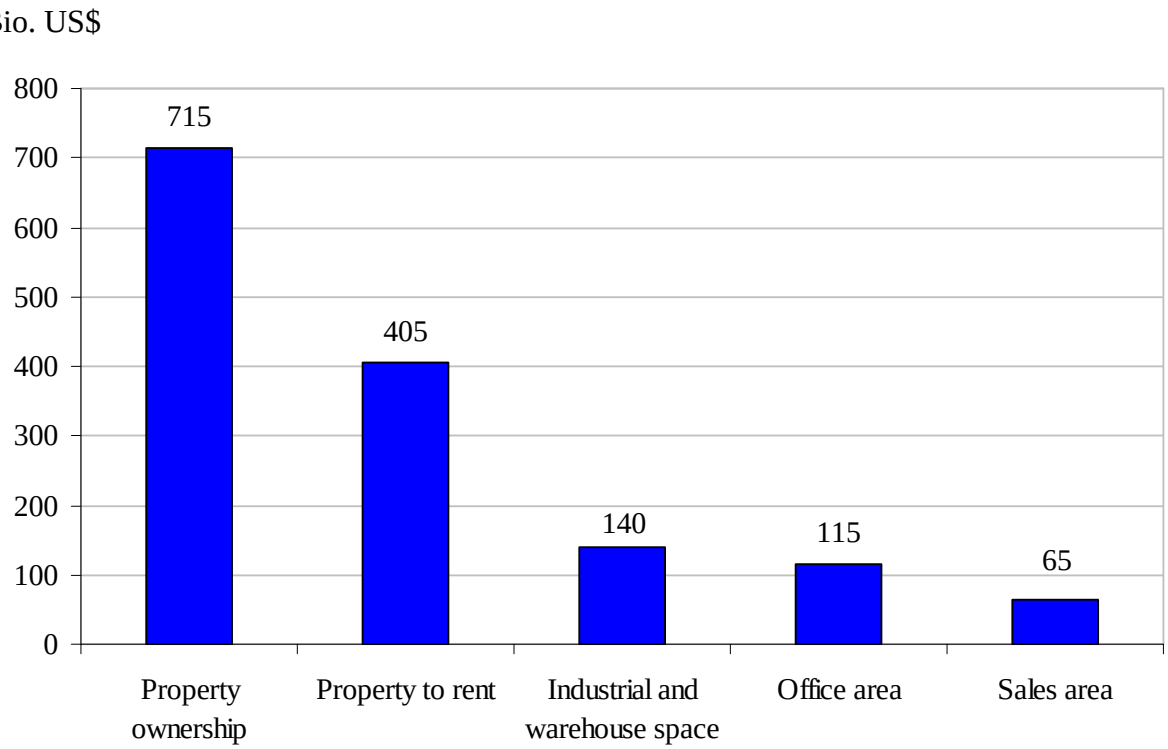


Figure 1.4 Total real estate value in Switzerland

Note. Data were drawn from Graf (2008) and Wüest & Partner (2006). Monetary data are reported in billion (bio.) US$, using exchange rates as of 31 December 2005 (CHF1 = US$0.76). Stock categories are rounded to 5 bio. US$.

The Canton of Basel-Stadt is the urban core of the Trinational Eurodistrict Basel (TEB). The TEB is a cross-border regional development cooperation of metropolitan size between 226 Swiss, French, and German cities and communities (TEB, 2010). The TEB includes a population of about 830,000 inhabitants and a surface area of 2,600 km^2, with the population living in Switzerland (65%), Germany (25%), and France (10%). The Basel region extends into the German federal state of Baden-Württemberg and the French region of Alsace, and forms the core of a European metropolitan region.

1.5.3 Erlenmatt

In a cooperative effort between the Department of Planning and Construction of the Canton Basel-Stadt, a private consultancy (ecos), and the landowner, a large urban redevelopment area was used as a case study: Erlenmatt, a mixed usage district with a development area of about 19.2 hectares, with about 700 flats for 1,800-2,000 dwellers and 1,100-2,000 working places. The stepwise development of 10 building plots is planned, to be realized within the next 15-20 years. Of the 19.2 hectares available, about 8 hectares will be landscaped as green spaces and 3.5 hectares will be maintained as a permanent nature reserve. In the midst of this green space, the remaining 11.2 hectares will be filled with buildings that provide their own form of noise insulation bordering the eastern adjacent main traffic arterial of Basel-North.

Occupying the site of the former freight yard of the German Railways Company in Basel North, Erlenmatt is one of the last sizeable development reserves available to the Canton of Basel-Stadt. The demands made on the urban development of this area are complex (cf. Vivico Real Estate GmbH (Vivico) 2007; RR-BS, 2010). The public participation process held in 1997/98 called for an innovative, sustainable development plan. In 2004, the cantonal parliament approved the rezoning of the site and the development plan by a substantial majority. The redevelopment process in Erlenmatt started after a cantonal referendum approved the zoning and building plan in 2005 by a substantial majority.

The case study area is adjacent to international freeways, a local recreation area, a railway station, and is ten minutes by car from an international airport in France. Direct access to local public transportation, the future Regio Rapid-Transit System Basel, and a district heating system is planned. The area is part of the 2,000-Watt society Pilot Region Basel (cf. Morrow & Smith-Morrow, 2008).[5] The structure of the case makes the Erlenmatt an exemplary case study area for the investigation of lifestyles in urban districts with a distinct human-environment system.

1.6 References

Ærø, T. (2006). Residential Choice from a Lifestyle Perspective. *Housing, Theory and Society, 23*(2) 109-130.

Barr, S., & Gilg, A. (2006). Sustainable lifestyles: framing environmental action in and around the home. *Geoforum, 37*(6), 906–920.

Blasius, J., & Friedrichs, J. (2008). Lifestyles in distressed neighborhoods: A test of Bourdieu's ''taste of necessity'' hypothesis. *Poetics, 36*(1), 24–44.

Blasius, J., & Winkler, J. (1989). Gibt es die "feinen Unterschiede"? Eine empirische Überprüfung der Bourdieuschen Theorie. *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, *41*(1), 72-94.

Bourdieu, P. (2007). *Distinction: A social critique of the judgement of taste*. Cambridge, MA: Harvard University Press.

Brueggeman, W. B., & Fisher, J. D. (2010). *Real Estate Finance & Investments* (14th ed.). Boston, MA: McGraw-Hill/Irwin.

Choo, S., & Mokhtarian, P. L. (2004). What type of vehicle do people drive? The role of attitude and lifestyle in influencing vehicle type choice. *Transportation Research Part A, 38*(3), 201-222.

Cockerham, W. C. (2005). Health Lifestyle Theory and the Convergence of Agency and Structure. *Journal of Health and Social Behavior*, *46*(1), 51-67.

Donaghy, K., Rudinge, G., & Poppelreuther, S. (2004). Societal Trends, Mobility Behaviour and Sustainable Transport in Europe and North America. *Transport Reviews, 24*(6), 679-690.

Dubois, N. (2003). *A sociocognitive approach to social norms*. London: Routledge.

Fiske, S. T., & Taylor, S. E. (2008) *Social cognition: From brains to culture* (3rd ed.). New York, NY: McGraw-Hill.

Georg, W. (1998). *Soziale Lage und Lebensstil: eine Typologie*. Opladen: Leske + Budrich.

Giddens, A. (1991). *Modernity and self-identity: self and society in the late modern age*. Cambridge: Polity Press.

Gifford, R. (2010). *Sustainable development: Psychological aspects*. Oxford: Oxford University Press.

Glavič, P., & Lukman, R. (2007). Review of sustainability terms and their definitions. *Journal of Cleaner Production, 15*(18), 1875-1885.

Graf, M. (2008). Fakten und Trends zu indirekten Immobilienanlagen in der Schweiz

(Presentation held at the SFA-Medienanlass „Schweizer Immobilienfonds trotzen der Krise“, 5 November 2008, Zurich). Basel: SFA (available at: https://www.sfa.ch/ [retrieved May 06, 2010]).

Guy, S., & Marvin, S. (1999). Understanding Sustainable Cities: Competing Urban Futures. *European Urban and Regional Studies*, *6*(3), 268–275.

Häberli, R., Gessler, R., Grossenbacher-Mansuy, W., & Lehmann Pollheimer, D.(2002). *Vision Lebensqualität. Nachhaltige Entwicklung. Ökologisch notwendig, wirtschaftlich klug, gesellschaftlich möglich*. Zurich: vdf.

Healey, P. (1991). Models of the development process: A review. *Journal of Property Research*, *8*(3), 219-238.

Heijs, W., Carton, M., Smeets, J., & van Gemert, A. (2009). The labyrinth of life-styles. *Journal of Housing and the Built Environment*, *24*(3), 347–356.

Henderson, J. V., & Ioannides, Y. M. (1983). A Model of Housing Tenure Choice. *The American Economic Review*, *73*(1), 98-113.

Hofstetter, P., Baumgartner, T., & Scholz, R. W. (2000). Modelling the valuesphere and the ecosphere: integrating the decision makers’ perspective into LCA. *The International Journal of Life Cycle Assessment*, *5*(3), 161-175.

International Monetary Fund (IMF) (2010). *World Economic Outlook Database, April 2010: Report for Selected Countries and Subjects - Switzerland*. Washington, DC: IMF (available at: http://www.imf.org/ [retrieved August 04, 2010]).

International Organization for Standardization (ISO) (2010). *ISO 21931-1:2010: Sustainability in building construction - Framework for methods of assessment of the environmental performance of construction works - Part 1*. Geneva: ISO.

Kemeny, J. (1992). *Housing and Social Theory*. London: Routledge.

Kettl, D. F., & Fesler, J. W. (2009). *The politics of the administrative process* (4th ed.). Washington, DC: CQ Press.

Kibert, C. J. (2008). *Sustainable construction: green building design and delivery* (2nd ed.). Hoboken, NJ: Wiley.

Koellner, T, Weber, O., Fenchel, M., & Scholz, R. W. (2005). Principles for sustainability rating of investment funds. *Business Strategy and the Environment*, *14*(1), 54-70.

Kriese, U. M. (2010). *Investors construct lifestyles: The environmental science perspective* (Doctoral thesis, No. 18802). Zurich: ETH (available at: http://e-collection.ethbib.ethz.ch/ [retrieved October 30, 2010]).

Lastovicka, J. L., Bettencourt, L. A., Shaw Hugner, R., & Kuntze, R. J. (1999). Lifestyle of the tight and frugal: Theory and measurement. *Journal of Consumer Research, 26*(1), 85-98.

Laws, D., Scholz, R. W., Shiroyama, H., Susskind, L., Suzuki, T., & Weber, O. (2004). Expert views on sustainability and technology implementation. *International Journal of Sustainable Development and World Ecology, 11*(3), 247-261.

Loukopoulos, P., & Scholz, R. W. (2004). Sustainable future urban mobility: using `area development negotiations' for scenario assessment and participatory strategic planning. *Environment and Planning A, 36*(12), 2203-2226.

Lyons, G., Chatterjee, K., Beercroft, M., & Marsden, G. (2002). Determinants of travel demand – exploring the future of society and lifestyles in the UK. *Transport Policy, 9*(1), 17-27.

Mackley, C. (2001). The planet in crisis. In C. A. Langston, & G. K. C. Ding (Eds.), *Sustainable practices in the built environment* (2nd ed.) (pp. 3-14). Oxford: Butterworth-Heinemann.

McDonald, S., Oates, C. J., Young, C. W., & Hwang, K. (2006). Toward sustainable consumption: researching voluntary simplifiers. *Psychology and Marketing, 23*(6), 515-534.

Michman, R. D., Mazze, E. M., & Greco, A. J. (2003). *Lifestyle marketing: Reaching the New American Consumer*. Westport, CT: Praeger.

Moll, C. (2006). *Bevölkerungsanalyse 1990-2005: Bericht im Auftrag des Regierungsrates*. Basel: Statistisches Amt des Kantons Basel-Stadt (available at: http://www.statistik-bs.ch/ [retrieved 03 August 2009]).

Moll, C., Schaulin, S., Kilchenmann, C., & Pfeifer, A. (2007). *Stadtentwicklung Basel-Nord: Controlling- und Monitoringbericht 2007*. Basel: Statistisches Amt des Kantons Basel-Stadt (available at: http://www.statistik-bs.ch/ [retrieved July 11, 2010]).

Morrow, K. J. Jr., & Smith-Morrow, J. A. (2008). Switzerland and the 2,000-Watt Society. *Sustainability: The Journal of Record, 1*(1), 32-33.

Munier, N. (2006). *Handbook on Urban Sustainability*. Dordrecht: Springer.

Plummer, J. T. (1974). The Concept and Application of Life Style Segmentation. *Journal of Marketing, 38*(1), 33-37.

Präsidialdepartement des Kantons Basel-Stadt (PD-BS) (2010). *Kantons- und Stadtentwicklung*. Basel: PD-BS (available at: http://www.entwicklung.bs.ch/ [retrieved August 14, 2010).

Rawls, J. (1999). *A theory of justice* (2nd ed.). Oxford: Oxford University Press.

Regierungsrat des Kantons Basel-Stadt (RR-BS) (Ed.). (1999). *Aktionsprogramm Stadtentwicklung Basel: Ergebnisse der Werkstadt Basel*. Basel: Staatskanzlei des

KantonsBasel-Stadt(availableat:http://www.aps-bs.ch/[RetrievedMay01,2010]).

Regierungsrat des Kantons Basel-Stadt (RR-BS) (2004). *Stadtteilentwicklungsplan Integrale Aufwertung Kleinbasel IAK: Ausgabe 2004*. Basel: Druckerei Thoma AG (available at: http://www.baselnord.bs.ch/ [retrieved May 02, 2009]).

Regierungsrat des Kantons Basel-Stadt (RR-BS) (2005a). *Ratschlag betreffendFinanzierung der Stadtentwicklung Basel-Nord* (Geschäfts-Nr. 05.0278.01). Basel: Kreis Druck AG (availableat:http://www.regierungsrat.bs.ch/[retrieved02May2009]).

Regierungsrat des Kantons Basel-Stadt (RR-BS) (2005b). *Zukunft Basel konkret: Bericht zur nachhaltigen Entwicklung Basel-Stadt 2005*. Basel: Kreis Druck AG (available at: http://www.statistik-bs.ch/ [retrieved March 19, 2009]).

Regierungsrat des Kantons Basel-Stadt (RR-BS) (2010). *Erlenmatt: Geschäfte*. Basel: Parlamentsdienst des Grossen Rates (available at: http://www.grosserrat.bs.ch/ [retrieved 30 January 2010]).

Regierungsrat des Kantons Basel-Stadt (RR-BS), & Christoph Merian Stiftung (CMS) (2010) *Basler Dialog 2010: „Stadtwohnen für alle"*. Basel: RR-BS (available at: http://www.medienmitteilungen.bs.ch/ [retrieved August 03, 2010]).

Reitzes, D. C. (1986). Urban Identification and Downtown Activities: A Social Psychological Approach. *Social Psychology Quarterly*, *49*(2), 167-179.

Rifkin, J. (1990). *The Green Lifestyle Handbook.* New York, NY: Henry Holt and Company.

Ropke,I.(1999).TheDynamicsofWillingnesstoConsume.*EcologicalEconomics*,*28*(3),399-420.

Salamon, L. M., & Anheier, H. K. (1996). *The Emerging Nonprofit Sector: An Overview*. Manchester: Manchester University Press.

Sansom, R. L. (1976). *The new American dream machine: toward a simpler lifestyle in an environmental age*. New York, NY: Doubleday.

Scholz, R. W. (2011). *Environmental literacy in science and society: From knowledge to decisions*. Cambridge: Cambridge University Press.

Scholz, R. W. Binder, C. B., & Lang, D. J. (2011). The HES-framework. In R. W. Scholz (Ed.), *Environmental Literacy in Science and Society: From Knowledge to Decisions* (pp. 721-737). Cambridge: Cambridge University Press.

Scholz, R. W., Bösch, S., Koller, T., Mieg, H. A., & Stünzi, J. (Eds.). (1996). *Industrieareal Sulzer-Escher Wyss: Umwelt und Bauen: Wertschöpfung durch Umnutzung* (ETH-UNS Fallstudie 1995). Zürich: vdf.

Scholz, R. W., Bösch, S., Mieg, H. A., & Stünzi, J. (Eds.). (1997). *Zentrum Zürich Nord: Stadt im Aufbruch: Bausteine für eine nachhaltige Stadtentwicklung* (ETH-UNS Fallstudie 1996). Zürich: vdf.

Scholz, R. W., Stauffacher, M., Bösch, S., & Krütli, P. (Eds.). (2004). *Mobilität und zukunftsfähige Stadtentwicklung: Freizeit in der Stadt Basel* (ETH-UNS Fallstudie 2003). Zürich: Rüegger und Pabst Verlag.

Scholz, R. W., Stauffacher, M., Bösch, S., & Krütli, P. (Eds.). (2005). *Nachhaltige Bahnhofs- und Stadtentwicklung in der trinationalen Agglomeration: Bahnhöfe in der Stadt Basel* (ETH-UNS Fallstudie 2004). Zürich: Verlag Rüegger.

Scholz, R. W., & Tietje, O. (2002). *Embedded Case Study Methods: Integrating Quantitative and Qualitative Knowledge*. Thousand Oaks, CA: Sage.

Schulze, G. (2005). *Die Erlebnis-Gesellschaft: Kultursoziologie der Gegenwart* (2nd ed.). Frankfurt am Main: Campus Verlag.

Schweizerischer Ingenieur- und Architektenverein (SIA) (2005). *Nachhaltiges Bauen – Hochbau: Ergänzungen zum Leistungsmodell SIA 112*. Zürich: SIA.

Sen, A. (2001). *Development as freedom*. Oxford: Oxford University Press.

Statistisches Amt des Kantons Basel-Stadt (2010). *Statistik Basel-Stadt*. Basel: PD-BS (available at: http://www.statistik-bs.ch/ [retrieved August 02, 2010]).

Steg, L. (2005). Car use: Lust and must. Instrumental, symbolic and affective motives for car use. *Transportation Research A, 39*(2-3), 147-162.

Swiss National Science Foundation (SNSF) (2010). *Sustainable Development of the Built Environment: National Research Programme 54*. Bern: SNSF (http://www.nfp54.ch/e.cfm?Slanguage=e [retrieved August 03, 2010]).

Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behavior. In S. Worchel, & W. G. Austin (Eds.), *The psychology of intergroup relations* (pp. 7-24). Chicago, IL: Nelson-Hall.

Thirlaway, K., & Upton, D. (2009). *The psychology of lifestyle: promoting healthy behaviour*. Milton Park: Routledge.

Trinational Eurodistrict Basel (TEB) (2010) *ETB Eurodistrict de Bâle – TEB Trinational Eurodistrict Basel*. Village Neuf: TEB (available at: http://www.eurodistrictbasel.eu/ [retrieved August 04, 2010]).

United Nations (UN) (1987). *Report of the World Commission on Environment and Development* (General Assembly Resolution 42/187, 11 December 1987). New York, NY: UN.

Vivico Real Estate GmbH (Vivico) (2007). *Erlenmatt: Dedicated to urban life - A new district for Basel*. Basel: Vivico (available at: http://www.erlenmatt.ch/ [retrieved 26 July 2010]).

von Thadden, E. L. (1995). Long-Term Contracts, Short-Term Investment and Monitoring. *Review of Economic Studies, 62*(4) 557-575.

Vyncke, P. (2002). Lifestyle segmentation: From attitudes, interests and opinions, to values, aesthetic styles, life visions and media preferences. *European Journal of Communication, 17*(4), 445-463.

Weber, O., Scholz, R. W., & Michalik, G. (2010). Incorporating Sustainability Criteria into Credit Risk Management. *Business Strategy and the Environment, 19*(1), 39-50.

Wells, W. D. (1974). Life Style and Psychographics: Definitions, Uses and Problems. In W. D. Wells (Ed.), *Life Style and Psychographics* (p. 317-363). Chicago, IL: American Marketing Association.

Wentling, J. W. (1990). *Housing by lifestyle: The component method of residential design*. New York, NY: McGraw-Hill.

Wetzemael, J. E. van (2005). *Investieren im Bestand: Eine handlungstheoretische Analyse der Erhalts- und Entwicklungsstrategien von Wohnbau-Investoren in der Schweiz* (Publikation der Ostschweizerischen Geographischen Gesellschaft, Heft 8). St. Gallen: Ostschweizerische Geographische Gesellschaft.

Wiener, D. (Ed.). (2001) *Wir sind die Stadt: Das Beispiel Werkstadt Basel*. Basel: Christoph Merian Verlag.

Wiener, D. (2006). So werden unsere Kinder gut leben. *Bisch zwäg, 98*(10), 12-15.

Wind, Y., & Green, P. E. (1974). Some Conceptual, Measurement, and Analytical Problems in Life Style Research. In W. D. Wells (Ed.), *Life Style and Psychographics* (pp. 97-126). Chicago, IL: American Marketing Association.

Wöhe, G., & Bilstein, J. (2002). *Grundzüge der Unternehmensfinanzierung*. München, Vahlen.

Wüest & Partner (2006). *Immo Monitoring 2006*. Zurich: Wüest & Partner AG.

Endnotes

[1]Examples of such building certification systems and standards are the BRE Environmental Assessment Method (BREEAM) from the Building Research Establishment (cf. Anderson, Shiers & Steele, 2009), the Leadership in Energy and Environmental Design (LEED) from the U.S. Green Building Council (cf. Kibert, 2008), the German Sustainable Building Certification (DGNB Certification System), from the German Sustainable Building Council, ISO 21931-1:2010 from the International Organization for Standardization (2010), and the Recommendations for Sustainable Construction from SIA 112/1 (cf. Schweizerischer Ingenieur- und Architektenverein (SIA), 2005).

[2]The section on Human-environment systems (HES) is taken from Scholz (2011) and Scholz, Binder and Lang (2011).

[3]Former Yugoslavian citizens (5.9%), Italian (5.3%), Turkish (4.4%), German (3.4%), Spanish (2.1%), and other national minorities live in the Canton of Basel-Stadt (Moll, 2006).

[4]A series of urban revaluation programmes started in 1997 and 1998 with the City Laboratory of Basel (cf. Wiener, 2001). In 1999 they resulted in the Action Program Urban Development Basel for Residential Upgrading and Housing Construction (RR-BS, 1999). In 2002, the governing council of the Canton implemented the Urban District Development Plan for the Integrative Revaluation of Kleinbasel (STEP IAK) (RR-BS, 2004). There is a campaign for urban housing called Logis Bâle, the Basilean investor talks, and the Urban Development Project Basel North (Moll, 2006; RR-BS, 2005a). The Canton has also established a report on sustainable development (RR-BS, 2005b), a controlling and monitoring report (Moll *et al.*, 2007), and is engaged in a Basel dialogue process called Urban Housing for Everyone together with the Christoph Merian Stiftung (RR-BS & CMS, 2010). Currently, the Canton of Basel-Stadt continues to follow this track of engagement and is involved in many intense and multi-faceted efforts for sustainable urban development (cf. Präsidialdepartement des Kantons Basel-Stadt (PD-BS), 2010, for an overview).

[5]The 2,000 Watt Society aims to reduce primary energy consumption in Switzerland by a factor of three to the average global demand, containing no more than 500 watts from non-renewable resources. Two thousand watts, with grey energy not included, is about average global demand (Morrow & Smith-Morrow, 2008).

2 What can we learn from lifestyle research for sustainable urban living?

Documentation of materials and groundworks

Abstract

The term “lifestyle” has been used differently in various disciplines and contexts. A critical question is how the buzzword “lifestyle” can be transformed into a scientific concept that can be used for science and practice on sustainable urban living. This article provides a review on lifestyle research which is based on three key structures: (1) traditional lines of lifestyle research (consumer behavior, public health, and urban housing); (2) human-environment matrices; and (3) fields of transition in urban systems. We define “lifestyle” by extending the Lewinian field theory to human-environment matrices. These include cognitive-behavioral, socio-demographic, situational, and socio-cultural submatrices, which influence the actualization of lifestyles. We identify urban services and behavioral patterns of energy & mobility, residential living, health care, working sphere, consumption patterns, leisure-time activities, and social networking as fields of transition. We propose a research template to analyze and affect lifestyles as a key component of sustainable urban systems.

Keywords: Lifestyles, Consumer behavior, Public health, Urban housing, Human-environment systems, Sustainable urban transition

2.1 Introduction

The term “lifestyle” has been vastly used in academic discourse but is still a scientific buzzword. Lifestyles, habits, habitus, consumption patterns, activities, decisions, motives, standard of living, and other constructs were used synonymously at times. A sufficient process-structure model providing a sound definition and description of lifestyles was lacking. This observation is remarkable since lifestyles, along with ecologically efficient technologies, can play a crucial role for sustainable transitions. Sustainable transitions need functional urban systems that shape ecological community, cultural form, social space, ideology, and spatial units of collective consumption (Saunders, 2004). Sustainable transitions of urban systems can also be a stabilizing force for a global population if it looks to meet its own needs and maintain resources worldwide (Holden *et al*., 2008).

Natural and social sciences stalwartly generate empirical results, but these cumulate poorly and thus reviews and meta-analyses that result in practice guidelines are needed (Cook *et al*., 1997; Rosenthal, 1991). Consequently, demands were made for a lifestyle theory that integrates cognitive-behavioral, situational, socio-demographic, and socio-cultural impacts on behavior (cf. Barr and Gilg, 2006; Sauberzweig, 1996). For this reason, we review lifestyle research for the purpose of defining this buzzword, identifying tasks for future lifestyle research, and providing a template for managing urban transitions.

2.1.1 Overview on traditional lines of lifestyle research

We start with an overview on the lifestyle concept and traditional lines of lifestyle research. The term “style” denotes “a mode of living”; “the way in which something is said, done, expressed, or performed”; “the combination of distinctive features”; or “a quality of imagination and individuality expressed in one's actions and tastes” (The American Heritage Dictionaries, 2000). Over a century ago, Simmel (1900) argued that lifestyles create distance from other people and the contents of life. Adler (1925) found evidence that lifestyles structure individual psychology. Differing from many socio-structural theories dominant at that time, lifestyle researchers argued that people with similar socio-demography do not necessarily think and behave homogeneously. For example, lifestyles differ by cognitive styles, culture and behavior of generations, sexes, ethnic groups, or consumer groups (Hong

et al., 2000; Michman, Mazze and Greco, 2003; Sobel, 1981). Lifestyles, structured by socio-demography, also provided added value for explaining human interaction (Otte, 2005). Lifestyle research was undertaken at the interface of psychology, sociology, medicine, environmental sciences, and planning. Amidst this diversity, three traditional lines of lifestyle research can be identified: consumer behavior, public health, and urban housing.

Consumer behavior: At the beginning of the 20th century, lifestyles were understood as a stratified domain of consumption that was determined by style rather than by individual labor market position (Weber, 1922). It was argued that people's socio-economic resources limit free choice on their mode of living. Later, marketing researchers investigated "typical lifestyle variables" (e.g., activities, interests, and opinions) and linked them to socio-demographic correlates (Plummer, 1974; Wells, 1974). Several studies showed how monetary, social, symbolic, and cultural capital are spent in consumption, leisure-time expenditures, and cultural activities (cf. Bourdieu, 2007; Otte, 2005). Much of this research was focused on aesthetic reasoning, self representations, and reflections on spending (e.g., Michman, Mazze and Greco, 2003; Vyncke, 2002).

Public health: A second line of lifestyle research investigated public health and included behavioral determinants of obesity, coronary heart diseases, diabetes mellitus, headaches, hepatitis, hypertension, human immunodeficiency virus, venereal diseases, cancer, and strokes. Many of these health disorders depend on the presence and absence of adverse and protective health habits (Tulchinsky and Varavikova, 2009). Physical activity, nutrition, drinking, smoking, illegal drug use, pharmaceutical intake, and stress management bring about adverse health consequences (e.g., Ash *et al*., 2006; Margareta-Eriksson, Westborg and Eliasson, 2006). The dominant epidemiological paradigm had largely neglected environmental or social settings when attributing the onset of breast cancer to harmful behavior (Brown *et al*., 2006). It was Stokols (1992) who showed the moderating effect of physical and social environments, their consequences on health, and feedback effects. Lifestyles provided added value for tracking disparities in health due to residential location, social processes, environmental hazards, exposures, and body burdens (Payne-Sturges and Gee, 2006).

Urban housing: A third line of lifestyle research asked how lifestyles are driven by the emulation of urban architecture and elites (Simmel, 1957). Many agglomerations have been

exposed to socio-cultural change and now connect to life-work environments (Ward *et al*., 2007). Gentrification of city centers by the upper-middle class is related to the integration of a practiced or desired lifestyle in the choice of housing location (Brun and Fagnani, 1994). Ornetzeder *et al*. (2008) have shown that households from car-free areas only emit about half as much CO_2 in both ground transportation and energy use as do other households. Such evidence revealed a link between lifestyles, income, education, regional peculiarities, community-building, and ecological impacts (Latham, 2003; Otte, 2005).

When reviewing these lines of research, we investigated three main questions: 1) What are formal characteristics that differentiate lifestyles, and how are they actualized by lifestyle settings in urban systems? 2) In which pathways of transition can sustainable urban living be promoted by evidence from lifestyle research? 3) Which motivational role do lifestyles play for human decision-making in urban systems? We will also discuss some lessons learned for sustainable urban living and future lifestyle research.

2.1.2 The application of lifestyles for sustainable urban development

Cities host domiciles, working and living space for the majority of people, and diffuse most economic, social, demographic, and environmental transformations (UNFPA, 2007). In 1800, only 3% of the human population of 1.2 billion was urban; by 1900, it was 15% of 1.7 billion people, and by 2005 it was just above 50% of 6.5 billion. By 2050, it is estimated that over 6 billion people will live in urban areas; about three quarters of the population (Smil, 2008; UNFPA, 2007). Climate change, pollution, noise, waste, ecosystem degradation, misuse of public space, material scarcity, congestion, and instability are common urban problems (Koellner and Schmitz, 2006; Scholz *et al*., 1997). Unsustainable ecological and social lifestyle settings belong to some of their correlates. Ecological sustainability is evaluated in terms of human and environmental impacts of products, services, and lifestyles across the life cycle (Huijbregts *et al*., 2008). Social sustainability depends on social fairness, allocative efficiency, and protection of ecosystems which enables people to realize their capabilities (cf. Costanza, 2003; Rawls, 1999; Sen, 2001). We focus on how lifestyle research has diversified in several and sometimes overlapping fields of transition in urban services and behavioral patterns: energy & mobility, residential living, health care, working sphere, consumption patterns, leisure-time activities, and social networking (cf. Figure 2.1). In the following, we

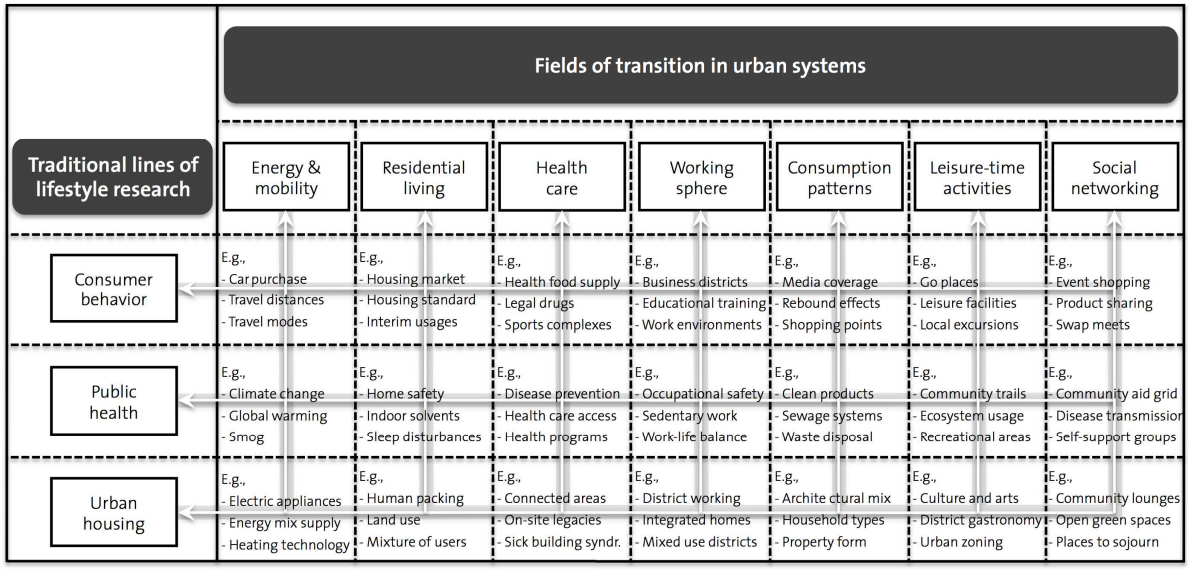


Figure 2.1 Fields of transition in urban systems by traditional lines of lifestyle research

briefly introduce these fields of transition in urban systems.

Energy & mobility: Energy use with its technologies and flows are related to residence, transportation, consumption, and services (cf. Schulz, 2007). Private households use energy mainly for transportation, heating/cooling, warm water supply, and electric power (Throne-Holst, Stø and Strandbakken, 2007). In order to reduce the average energy consumption and CO_2 emissions, some recent societal energy standards aim at using "2000 Watts" of energy per capita an hour or a maximum emission of "1 ton of CO_2" per capita a year for fossil energy (Schulz, 2007). The reduction of such ecological burdens depends on population, social needs, and ecological efficiency (Kohler, 1999) making vital behavioral and technological changes.

Residential living: Residential living deals with decisions on purchase, use and disposal of interior design, furniture, housing density, layout, equipment, facilities, and housing services. The potentials for social and ecological cities and ecological savings of residential supply have not been exhausted (Curwell and Cooper, 1998).

Health care: For effective health care, we need to know the conditions, protection, and consequences of lifestyles to maintain an adequate standard of living. Research on physical activity, nutrition, use of drugs, pharmaceutical intake, sleep, and risk-taking behavior constitute much of the discourse (Tulchinsky and Varavikova, 2009).

Working sphere: Work is employment by means of paid labor, unpaid domestic and childcare work, or voluntary services (Haworth and Veal, 2004). It considers habits, symbolic motives, and identification with the institution and the profession.

Consumption patterns: Consumers make decisions on the purchase, use and disposal of goods, services, activities, and ideas (Hoyer and MacInnis, 2007). Consumption patterns are thus important for their life cycle impacts (Throne-Holst, Stø and Strandbakken, 2007).

Leisure-time activities: Urban leisure lifestyle research focuses on socio-spatially differentiated activities during leisure time. Studies on leisure consider physical activity, mobility, consumption, tourism, and the engagement of people, including those in the workforce and the unemployed, children and retired people (Haworth and Veal, 2004).

Social networking: Social networks are systems of actors that consist of nodes and ties of resources and social capital. They are linked to the diffusion of communication between individuals and groups (Rogers, 2003) and are relevant for urban systems, as lifestyles diffuse through learning experiences in social networks.

2.2 The actualization of lifestyles in urban systems

Leading lifestyle theories focused on the key elements of habit, habitus, and distinction for formalizing lifestyles (Bourdieu, 2007; Elias, 1991; Georg, 1998). Two approaches from psychology and sociology, habit and habitus, were commonly used as key lifestyle components. In psychological terms, habits are an efficient mode of well-practiced and stable patterns of performing thinking and behavior. They are triggered by contextual learning experiences associated with past reward (Blasius and Winkler, 1989:74-76). Hull (1952) modeled behavioral tendency with a reaction-evocation potential ($_{S}E_{R} = f(_{S}H_{R} * D * R)$) where habits play a motivational role. A habit, $_{S}H_{R}$, follows a stimulus, S, intervening between psychological drive, D, and strength of reward, R. Satisfaction of needs strengthens the stimulus-response (S-R) association, resulting in the development of habits (Hull, 1952). For example, historical studies revealed that city parks stimulated the recreation of the middle class and symbolized a sophisticated lifestyle, evoking distinct patterns of walking habits (de Vos, 2005).

In sociological terms, habitus is a structural force for individuals. It is related to a need for distinction in order to stand out from others and express an individual way of living (Bourdieu, 2007; Elias, 1991). The habitus refers to the auto-regulative segregation of a social class that forms people according to the difference in available capital (Bourdieu, 2007). This socialization influences learning of attitudes, aesthetic distinctions, and taste that express social position. Research on Bourdieu's "taste of necessity" assumption has shown that people of lower social classes cannot efficiently increase capital since they are hardly able to convert "cultural capital" into "economic capital" and vice versa (Blasius and Friedrichs, 2008). Housing tenure is also a source of social inequality, which creates young people's preference of owner occupancy because it portrays a symbolic image of success (Rowlands and Gurney, 2001). Homeownership fosters local ties and decreases migration compared to renting (Helderman, Mulder and van Ham, 2004).

Lifestyles are patterns of thinking and behavior with habitual and self-identificatory potential through which individuals express social affiliation and distinction. The individual valuation of group membership is an affiliative and distinctive reaction to the socio-cultural setting. Shared symbolic repertoire and solidarity creates a feeling of belonging to a group (Durkheim, 1965). With regard to the meaning placed on driving a car, a symbolic motive of distinction is related to frequent driving, a positive attitude towards cars, male gender, and young age of respondents (Steg, 2005). Thus, the concept of habit gives insight on the cognitive-behavioral components of lifestyles, whereas habitus is useful for understanding their differentiation by socio-cultural components.

How can the diversity of functions of the symbolic motives for the differentiation of lifestyles be understood? In integrative terms, lifestyles serve to express affinity towards ingroups and positive role models and differentiation towards outgroups and negative role models. According to the social identity theory, people have multiple social identities, and the salient ones depend on and change with the immediate social context in which one is embedded. Empirical evidence for the social identity theory has found that people exhibit cognitive biases as social identity becomes salient. They select their ingroup against outgroups based on ingroup homogeneity, ingroup favoritism, and outgroup stereotyping (cf. Tajfel and Turner, 1986). Actualization of lifestyles means their development, maintenance, and change

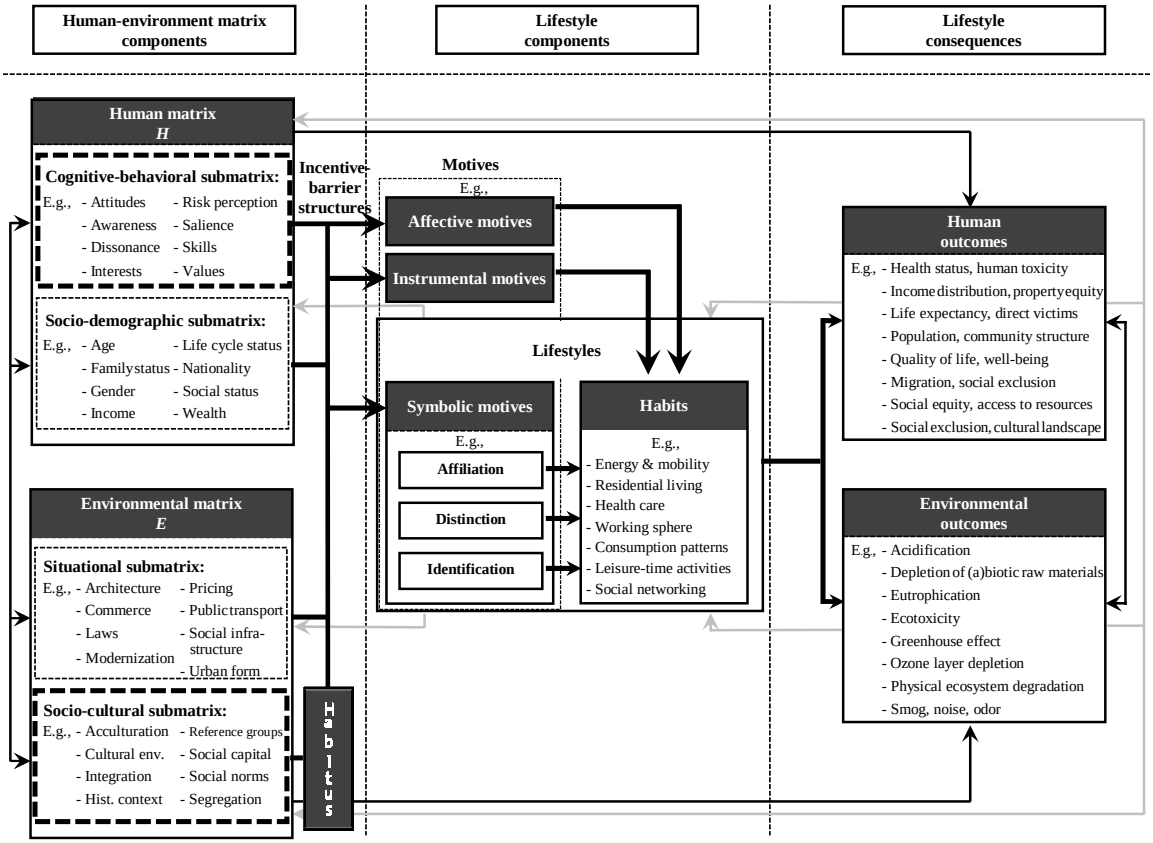


Figure 2.2 Process-structure model of lifestyle settings in human-environment systems

Note: The theoretical framework was adapted from Bourdieu (2007), Chaney (1996), Esser (1996), Georg (1998), Hull (1952), Lewin (1951), Mischel (1981), Scholz and Binder (2004), Scholz and Tietje (2002:285-303), Steg (2005), and Tajfel and Turner (1986).

over time. Lifestyle researchers have made efforts to establish differentiated impact-outcome and process-structure models for these domains. Lifestyles depend on social identity and are framed by cognitive, social, cultural, demographic, and situational components (Bonaiuto *et al*., 1999). In this review, we use a human-environment ($H \times E$) matrix approach to review the processes and structures of lifestyle settings in several fields of transition (cf. Figure 2.2).

The human-environment matrix consists of the material and cultural spheres in which human and environmental dynamics are embedded. Lifestyles have consequences on the local, regional, and global level of individuals, communities, and societies. Using the Lewinian field theory, we refer to the actualization of lifestyles as impacted by person and environment (Lewin, 1951). Lifestyles, L, are a cognitive-behavioral function of human and environmental matrices, i.e. $L = f(H, E)$. From a psychological perspective, person and

situation influence behavior (Mischel, 1981); and from a sociological perspective, socio-demography and socio-culture do (Baldassare, 1992). The concept of habit refers to the psychological correlates of lifestyles, whereas habitus refers to their sociological correlates.

The review is structured along the theory of human-environment systems (Scholz and Binder, 2004). Urban systems are connected flows between metropolitan configurations that represent a special type of human-environment systems (Limtanakool, Schwanen and Dijst, 2009; Scholz and Binder, 2004). Urban systems host a multitude of lifestyle settings, which are processes and structures defined by the situational context of time, place, and environmental condition. We use the human-environment matrix approach as a conceptual framework to illustrate current lifestyle research with relevance to urban living. The human matrix represents cognitive-behavioral and socio-demographic properties of individuals, whereas the environmental matrix represents situational and socio-cultural framework conditions. By matching the traditional lines of lifestyle research (cf. Figure 2.1), we present the human-environment matrix along its psychological and sociological submatrices (cf. Figure 2.2). We point out possible pathways of transition in order to facilitate sustainable urban systems by changing urban services and behavior.

2.2.1 Human matrix

Lifestyle research revealed that cognitive-behavioral and socio-demographic components are related to the differentiation of lifestyles in urban systems.

2.2.1.1 Cognitive-behavioral submatrix

Skills, interests, preferences, attitudes, traits, environmental awareness, belief systems, aesthetics, environmental choices, cultural context, and happiness were found to be contingent to habits and lifestyles (Chaney, 1996; Fowler and Christakis, 2008; Otte, 2005).

Consumer behavior: People use resources in order to maximize utility and to satisfy their idiosyncratic preferences (Sanne, 2002). Adolescent convention visitors congregate in entertainment-related leisure areas and pavilions with dynamic displays, allowing them distinct fun, excitement, and relaxation (Cotterell, 1991). The symbolic meaning of subcultural adolescent identities can shape consumer preferences (Bennett, 1999). Knowing the peculiarities

of consumer lifestyles and education can enable people to execute relinquishment and substitution and to reduce consumption (cf. Sanne, 2002). Extensions of consumer typologies have to include lifestyles, belief-attitude-intention models, and subcultural identifiers, e.g., norms, values, customs, attitudes, or traditions (Michman, Mazze and Greco, 2003:9; Sanne, 2002).

Awareness of contiguities, commitment, personal and social norms, attitudes, values, satisfaction, self-organization, and intrinsic barriers influence domestic waste management and recycling (Aini *et al*., 2002; Carlsson-Kanyama, Engström and Kok, 2005; Hansmann *et al*., 2006). The identification of needs, styles, and resource flows would help to design sustainable interventions for urban waste systems.

Public health: Daily physical activity should constitute 30 minutes of moderate-to-vigorous movement, such as brisk walking, bicycling, stair climbing, housework, yard work, or other physical exercise (U.S. HHS, 1996). Physical activity is related to: skill training and its stability during adulthood, non-smoking, fruit/vegetable intake, quality of sleep, self-management, social functionality, recreation, feelings of safety when going out, a sense of well-being, scenery perception, urban trail use, and commuting (Brownson *et al*., 2000; Gobster, 2005; Jurj *et al*., 2007). It buffers urban health stressors and protects against obesity, coronary heart disease, hypertension, stroke, type 2 diabetes mellitus, metabolic syndrome, osteoporosis and arthritis, rigidity, colon cancer, mental disease, and disability (Jurj *et al*., 2007; U.S. HHS, 1996). Knowledge on the health benefits of physical activity involved in housework or commuting is still sparse (Hou *et al*., 2004). Unhealthy nutrition is related to smoking, stress, and drug abuse and it enhances body mass, cardiovascular and chronic disease, cancer, and the impact of air pollution on health. Complex carbohydrates, fruits and vegetables, antioxidant foods, and energy expenditure are some protectors (Ruel, Haddad and Garrett, 1999). Moderate-to-vigorous physical leisure-time activity, such as sports, is associated with non-smoking (Pitsavos *et al*., 2005), low alcohol consumption, trying to lose weight (Dowda *et al*., 2003), low fat intake, and high fruit/vegetable intake (Matthews *et al*., 1997). Social networking is also related to the transmission of diseases and it influences health behavior and the structure of health systems (Luke and Harris, 2007). Thus, enhancing skills, social networking, and motivation of urban residents may promote healthy lifestyles.

Urban housing: Residential energy consumption changes with the lifestyle-related demand for resources. The comfort needs of households motivate heating habits, a mix of electricity and energy used, housing technology systems, and equipment rates (Genjo *et al*., 2005; Weber and Perrels, 2000). Lifestyles also differentiate frequency and distance of car use, traveling for work, and leisure (Lanzendorf, 2002). People prefer mobility strategies that lower personal costs, frustration, dissatisfaction, and loss of control (Cao and Mokhtarian, 2005; Loukopoulos *et al*., 2004). This evidence shows that demands, needs, preferences, and strategies are related to lifestyles.

Balancing the arguments for housing mode, residential choice, and community of practice depends on interests, emotions, aesthetics, acculturation, affective density, processing of parental norms, and rural/urban orientation (Billari and Liefbroer, 2007; Brun and Fagnani, 1994). In turn, housing environments supporting one's own lifestyle foster district identification, physical fitness, and ecological protection (Walker and Li, 2007). An association between response efficacy, vulnerability, and belief in the efficiency of alternatives to retrofit intentions has also been found (Lam, 2006). For traditional working-class neighborhoods, Topalov (2003) argued that the cognitive tools used by local authorities, charity workers, sanitarians, planners, and reform-minded politicians determine the categorization of people and places. These examples show that cognitive drivers influence residential choice, community practices, planned housing interventions, and urban renewal.

With regard to the working sphere, aligning businesses to their own interests, values and passions enhance entrepreneurs' quality of life, social integration, and identification (Marcketti and Niehm, 2006). Leisure-time activities are also related to people's interests. Moreover, similarities in personality traits are related to ego-centered social networks (Kalish and Robbins, 2006). Extroverted and less individualistic people with closed social networks tend to categorize social relationships according to group membership. Changes in personality traits are related to changes in the social network structure, whereas the need for admiration and a lack of empathy are related to a decline in social networking throughout the life cycle (Foster, Campbell and Twenge, 2003), although most people seeking admiration must seek an aligned audience. Thus, identification, reference groups, and personality traits are relevant for virtual social networking in urban systems.

2.2.1.2 Socio-demographic submatrix

The socio-demographic submatrix reflects the socio-structure of the individual and the residential milieu. Lifestyle segmentation is more exact when using socio-demographic predictors like education, household composition, gender, and age (Georg, 1998).

Consumer behavior: Patterns of consumer behavior depend on age, sex, and life cycle status. Sidin *et al*. (2008) investigated consumption attitudes and intentions of urban children and found that age and city of dwelling are more influential than gender. Singh and Patel (1984) found that consumption of dairy products is related to occupation and socio-economic rank. Changes in socio-economic household characteristics, such as the age distribution of the family unit, are related to changing energy demands due to patterns of transport services and gasoline expenditure (Greening and Jeng, 1994). Sustainability interventions for the decision framework of consumers thus have to include the needs of these groups for consumption and also for waste disposal.

Public health: On a national level, higher income is related to less physically demanding occupations, more sedentary lifestyles, passive leisure activities, and new technologies. But income, socio-economic status, education, occupational class, age, ethnicity, and place of residence are also individually relevant for physical activity (Brownson *et al*., 2000). Socio-economically advantaged and educated people as well as vegetarians in small or urban households are more interested in healthy nutrition (Hoek *et al*., 2004). Profession is related to health (Tountas *et al*., 2007), and fruit/vegetable access is less limited with higher income (Hendrickson, Smith and Eikenberry, 2006). Thus, socio-demography affects the healthiness of lifestyles.

Urban housing: Total CO_2 emissions at home differ by age, family status, household size, income, and situational components like climate or energy carriers (Weber and Perrels, 2000). Car use is much more dependent on income than is space heating in the home. In Japanese households, the use of residential electricity is related to wealthier lifestyles, which is expressed by a higher number of larger-sized electrical appliances (Genjo *et al*., 2005).

Residential choices depend on household income (cf. Brun and Fagnani, 1994). The lifestyles of the caretakers of urban working-class households in South Manchester are still very dependent on their communities' socio-economic infrastructure (Ward *et al*., 2007).

Homelessness is related to low income, breaks in the life cycle, and the male gender, although more and more women are also becoming affected by homelessness.

Social lifestyles of asthmatic children are inversely related to parental income (Shapiro and Stout, 2002). Moreover, women have a less extensive social networks in their professional lives, while men socialize less in their leisure time. Social restratification is related to either stigmatized or gentrified housing as well as residential segregation and decline of real estate value in urban areas (Harth, Herlyn and Scheller, 1998). Socio-demographic components also affect occupation, payment, and working time. Participation in the paid labor force is much more restricted to family circumstances for women than it is for men (e.g., National Statistics, 2005). Women in the UK are five times more likely than men to work part time, to experience a heavy payment penalty, and to be over-represented in lower paid sectors (Manning and Petrongolo, 2004; Ward *et al*., 2007).

Age, education, gender, household composition, social strata, and income are related to leisure-time activities, political party preference, and residential choice (Otte, 2005). Also, young adults place greater value on the diversity of social and cultural activities in the city center, whereas elder people prefer attractive natural environments (Tallon and Bromley, 2004). This suggests that socio-structural inequality still affects urban living.

2.2.2 Environmental matrix

Lifestyle research also revealed that situational and socio-cultural components are related to the differentiation of lifestyles in urban systems.

2.2.2.1 Situational submatrix

The situational submatrix consists of the lifestyle setting that is cognitively linked to the socio-cultural and human matrix. Incentives, stability of social production, culturally preshaped models of the situation, and processing of information influence the logic of action (Esser, 1996). Accordingly, lifestyle settings provide incentive-barrier structures for self-realization that facilitate or inhibit sustainable urban living.

Consumer behavior: The choice and willingness to consume are oftentimes restricted by situational constraints such as working conditions, social norms, urban structure, legal and organisational changes, availability of products, or price differences (e.g., Hertwich, 2005; Sanne, 2002). Media coverage is also linked in forming the identity of corporate networks and entrepreneurial urban consumer lifestyles (Greenberg, 2000). Sustainable shopping carts, educational programs, and simulation games were developed that induced changes in attitudes and increased consumer awareness. Removing external barriers and motivating urban consumers are thus prerequsites for facilitating sustainable consumption.

For sustainable waste management, decision-makers can provide flexible and innovative frameworks (Lang *et al*., 2006). Local waste support systems need extrinsic motivators of an economic, informational, administrative, and physical nature (Lindén and Carlsson-Kanyama, 2003). Waste pricing and informational campaigns on recycling benefits, as well as littering laws and garbage container siting were also discussed.

Public health: The technological modernization of urban systems worldwide has shifted physical activity, dietary structure, energy expenditure, car use, occupation, household work, and health throughout the life-cycle (Galea and Vlahov, 2005; Popkin, Duffey, and Gordon-Larsen, 2005). Although urban areas generally have a more sophisticated basic infrastructure than rural areas, they are not always sufficient for sustaining healthy lifestyles, especially in developing countries (UN-Habitat, 2007). Many disadvantaged urban areas show inadequate social infrastructure and land-use or a mismatch of neighborhood and lifestyle conditions (Gordon-Larsen *et al*., 2006; Villard, Ryden and Stahle, 2007). The proximity, availability and quality of health care arrays, community trails, sports complexes, and social resources, as well as their accessibility and segregation, affect health lifestyles (e.g., Galea and Vlahov, 2005). Investing into neighborhood access, social services, nature, community trails, and medical specialists could thus mitigate social disparity in access to health care facilities.

Although food options have increased worldwide, there is still a differential supply of diversified, healthy and processed foods from which rich urbanites profit most (Popkin, Duffey and Gordon-Larsen, 2005; Ruel, Haddad and Garrett, 1999). This is especially true for urban and rural systems of developed and emerging countries. For example, traditional

staples in north-east Brazil are more and processed food is less expensive in urban than in rural areas (Musgrove, 1988). Higher income, easier proliferation, differentiated demand, cultural heterogeneity, modern norms, and values were named as some reasons. Accordingly, urbanization, modernization and other constraints affect the nutritional lifestyles of residents.

Urban housing: The total CO_2 emissions are lower in French than in German or Dutch households, due to varying energy mixes, climate, and lifestyles (Weber and Perrels, 2000). Also compact multistory housing, energy-efficiency, renewable fuel mixes, flexible public transport, central business districts, and mixed-use districts can make cities more sustainable (Lanzendorf, 2002; van de Coevering and Schwanen, 2006). However, the situational submatrix is often contrary to sustainable urban housing. A lack of affordable housing or schools, congestion, ecological trade-offs, or family reasons push young families out of the city, entrenching car use and single-family housing (Urban Task Force, 1999). This fosters vehicle-focused infrastructure and sprawled services into a downward spiral (Camagni, Gibelli and Rigamonti, 2002).

Urban, semi-urban, and rural settings differentiate the lifestyles of health and social living (UN-Habitat, 2007). For example, road rage, over-crowding, and the lack of leisure facilities, shelter, or social infrastructure can create disturbing urban environments (Frumkin, 2003). On the other hand, architecture of mixed multistory housing, public transport, leisure avenues, and sports complexes attract matching lifestyles and foster recreation, social exchange, and home values (e.g., Sallis *et al.*, 2006). Urban planners began replacing physically separated life domains with connected adaptable districts wherein people can live, work, and recreate (Urban Task Force, 1999). This limits the need for mobility and creates valuable, attractive, and lively urban quarters. Social and ecological housing projects can also revitalize industrial sites, brownfields, and city centers (Scholz *et al.*, 1996). Sustainable stock investments and gentrification help against the negative mental image of distressed neigborhoods, and induce identification, engagement, neighborhood attachment, and social restratification (Blokland, 2008; Harth, Herlyn and Scheller, 1998). The built environment shapes cultural identity, as it forms essential aspects of collective memory, regional diversity and culture (Kohler, 2002, 2008). Reflecting urban form, modes of living and site history can thus guide a conjunction of lifestyles, resource use, culture, and ecology (van de Coevering and Schwanen, 2006).

Public green and open spaces, leisure facilities, health services, commerce, crossings, and

places where people meet are social site conditions. Because most urban residents have easier access to park facilities and public spaces than to other natural settings, these need park and recreation management (Sallis *et al.*, 2006). More people would be physically active if community trails, e.g., pathways for walking, bicycling, and other activities, were well placed (Harrison, Gemmell and Heller, 2007). Urban greening can thus serve for both community living and health.

2.2.2.2 Socio-cultural submatrix

The socio-cultural submatrix consists of culturally transmitted social structures, networks, and communication systems that affect individuals and their social processes (Bourdieu and Waquant, 1992). Lifestyles spread along social network pathways structured by homogeneity, conformity, and learning experiences of strong and mid-well acquaintances (Onnela *et al*., 2007; Otte, 2005). Processes of effective socialization also depend on reference lifestyles shaping the socio-cultural transmission of preferences, norms, attitudes, values, aspirations, expectations, and acceptance (Sallis *et al*., 2006).

Consumer behavior: Rethinking ground floor usages, reusage, and interim usages of urban development sites and their potential for attracting people are relevant for social urban living. Local meeting points for culture, gastronomy, swaps, trade shows, and shopping can serve as interim usages to create modern urban district gentrification on former brownfields. City districts with niches for “creative class workers” (cf. Florida, 2005) with dense networks of innovative people and a diversity of human, social, and cultural capital are well positioned to prosper. Such technology clusters are said to attract young, talented, and tolerant workers, and creative professionals and migrants with novel combinations of ideas (Hoyman and Faricy, 2009). Such city districts promise to stimulate economic growth and natural outdoor amenities for a higher quality of life (McGranahan and Wojan, 2007), which can attract new urban middle-class lifestyles as Western cities change from production to branded sites.

Public health: Socio-cultural components help to actualize health lifestyles. A social spread was found for the transmission of obesity, depression, and hard drinking, as well as for happiness and willingness to quit smoking (Christakis and Fowler, 2007; Fowler and Christakis, 2008; Smith and Christakis, 2008). Among the socio-cultural correlates for walking and cycling can be knowing regular exercisers, having an exercise partner, or having a club

membership. Further evidence has shown that urban Latinas are at higher risk for cardiovascular disease and stroke than urban white women, possibly due to the cultural mediation of less physical activity and higher rates of obesity (Wilbur *et al*., 2003). Social support in neigborhooods and by peers makes physical activity easy and enjoyable, which supports self-esteem and quailty of life throughout the life cycle (Sugiyama and Ward Thompson, 2007; Yarcheski, Mahon and Yarcheski, 2003). This evidence suggests that socio-cultural components are relevant for urban public health.

Urban housing: The social milieu is the environment of human relationships in which people carry out their socially aggregated activities. They generate distinct patterns of urban living, and their lifestyles serve as strategic means for making social contacts (Diaz-Bone, 2003). For example, lifestyles of young urbanite parents living centrally actively depend on functional social milieus. They enable gentrification, cultural living, social exchange, and working (Karsten, 2003). The transmission of acculturation, social class, and lifestyle choices influence decisions on where to live and spatial assimilation of immigrants (Yu and Myers, 2007). Several historical studies have also shown that connecting urban lifestyles to socio-cultural change provides an understanding of urban living (Kriese and Scholz, submitted; Maderthaner and Musner, 2003; Ward *et al*., 2007).

Enhancing district identification is a challenge for sustainable urban planning. Lacking neighborhood attachment can be due to negative mental geographies and a "spoiled identity" of subsidized housing, ghettos, and disadvantaged residential areas. This leads to self-stigmatization, demotivation of residents, segregation, and lack of identification (Lee and Murie, 1999:637). Social area analyses of urban geography need to consider the cultural and symbolic properties of lifestyles that lead to socially segregated networks (Helbrecht and Pohl, 1995). Communication among societal subgroups on their biased mutual beliefs aids in an understanding of safety, space, social behavior, and physical activity (Tallon and Bromley, 2004). The Chicago School of Sociology examined how social problems of fast urbanization and the differentiation of subcultures, milieus, styles of action, and social disintegration come about (Park, Burgess and McKenzie, 1974). In ghettos suffering from violence and alcoholism, structural changes of an excluded underclass are associated with anxiety, insecurity, hostility, a morphing of identity and community, and eroding social bonds (Winlow and Hall, 2006). Such dysfunctional social environments result in stress, feelings of unsafety, fear of crime and

outdoor activity, alienation, or outward migration.

Providing a variety of social capital such as voluntary participation in community-based associations, companionship, care, economics, and local activities fosters the networking of elderly people (Selvaratnam and Tin, 2007). This counters social exclusion, loneliness, desolation, depression, and marginalization. Modernization agendas use active citizenship in underprivileged districts and use local governance, tenant empowerment, or district management for gentrification (Franke, 2007; McKee and Cooper, 2008). It enhances community spirit, residential collaboration, community-based initiative, and district cleanliness, while avoiding social conflicts, littering, substance abuse, vandalism, and crime.

The socio-cultural submatrix is also important for the work life. For example, a cultural shift positively affects social support at work for female Mexican-Americans, whereas cultural resistance or cultural incorporation enhance work stability (Rojas and Metoyer, 1995). Moreover, a low complexity of links between organizational units and high social density of employees is a marker for informational silos that make organizations less efficient (Merrill *et al*., 2008). Thus, socio-cultural components of ethnicity and organizational culture affect the efficacy of working spheres.

2.3 The motivational role of lifestyles for human self-regulation

The development, maintenance, or change of lifestyles depends on how their consequences are evaluated. This evaluation is related to primary feedback loops which provide positive or negative feedback on immediate action (cf. Scholz and Binder, 2004). Lifestyles are also motivated by secondary feedback loops. They act through dislocated processes and sometimes unintended or collateral side effects. For example, higher efficiency in production of energy-efficient cars can lead to lower costs and less per unit consumption, but this may motivate rebound effects through longer distances traveled or the purchase of bigger cars (de Haan, Mueller and Peters, 2005). Social diffusion is then able to influence the lifestyles of human interaction, and may change consumption, supply, or policies. Accordingly, we discuss the role of lifestyles for motivational processes in action cycles. Lifestyles are full of meanings to individuals (Holt, 1997), and their textual enrichment motivates decision-making in their actualization (Chaney, 1996).

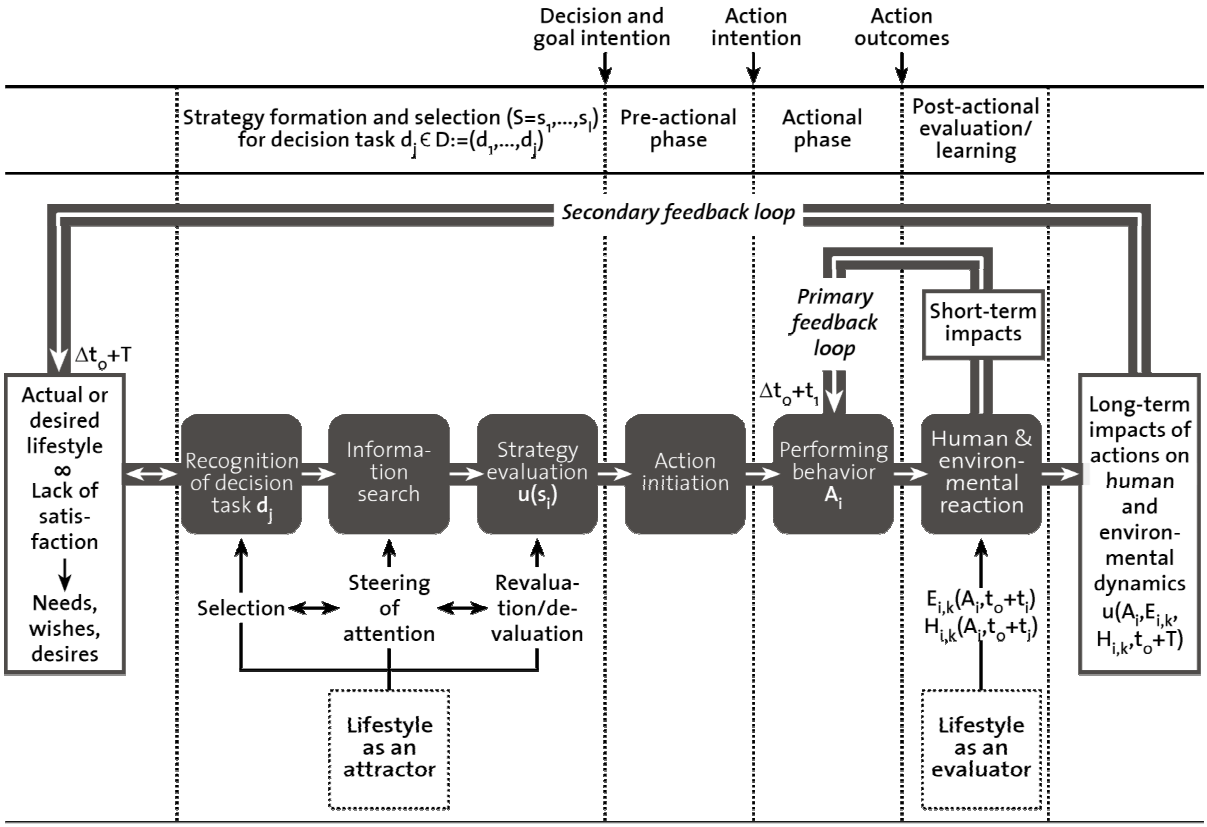


Figure 2.3 Decision and motivational action cycle model with lifestyles as an attractor and evaluator

Note: The theoretical framework was adapted from Gollwitzer (1996), Michman, Mazze, and Greco (2003), Scholz and Binder (2004), and Tversky and Kahneman (2004).

Figure 2.3 presents lifestyles as a motivational attractor and evaluator in human self regulation. Lifestyles are involved in strategy formation and selection by attracting habit completion and in post-actional learning through evaluation. We sketched how lifestyles can become a cognitive-behavioral component of decision-theoretic modeling.

Before the decision-making process starts, present and desired target states are compared. According to Tversky and Kahneman (2004), people pursue a process of maximization by choosing acceptable alternatives and pursuing them effectively. In the pre-decisional phase of strategy formation and selection for a decision task, dissatisfaction is induced by a sub-standard deviation between the present and target state, where salience induces a motivation to nullify the discrepancy (Fiske and Taylor, 2008). Lifestyle incongruity between cultural and material lifestyle and socio-economic status is proposed as causing psychosocial stress (McDade, 2001). Thus discrepancies and trade-offs are involved in

this stage. As a decision task is recognized and selected from the edited set of discrepancies, $d_j \in D \coloneqq (d_1,...,d_J)$, people start information search regarding dissonance reduction (Festinger, 1964). A phase of framing follows whereby the decision task is preliminarily analyzed and potential action, contingencies, and outcomes are evaluated (Kahneman and Tversky, 1979). For a salient dissonance reduction task, decision alternatives from a framed set of strategies, $s_i \in S \coloneqq (s_1,...,s_I)$, are assessed in the phase of strategy evaluation. For example, people realize lifestyle preferences through residential choice and housing (Ærø, 2006). Residents that prefer and live in car-dependent neighborhoods drove the most, walked the least, and were obese about twice as often as those in walkable neighborhoods (Frank *et al*., 2007). Inheritance of homes and family context also affect residential choice, lifestyles, and housing quality due to added social capital (Mulder, 2007). Studies on incentive structures suggest that decision routines persist at decision strategies rather than at options in strategy selection, thus unburdening cognitive capacity but diminuishing adaptive flexibility (Bröder and Schiffer, 2006). Due to trade-offs in pre-decisional evaluation, prospects with low utility are eliminated, and others are devaluated and then excluded stepwise if the reduction of dissonance is small. The remaining prospect is chosen due to its highest utility $u(s_i)$.

After strategy selection (Tversky, 2004), a goal intention for the planned behavior is implemented (Ajzen, 1991). The pre-actional phase is then entered, where an alternative is chosen to accomplish habit completion by performing the behavior in the actional phase. In these volitional phases, action is initiated and performed in order to reduce cognitive dissonance (Festinger, 1964; Gollwitzer, 1996; Oettingen and Gollwitzer, 2000). However, not every planned behavior is carried out due to inhibited goal achievement (Scholz, 1987), e.g., emotional barriers, forgetting, skill deficits, time constraints, or lack of resources. Also, many decisions on residential choice, housing quality, tenure, mobility, migration, access to residential areas, and the provision of compliant infrastructure are restricted by lifestyles and available resources (Mulder, 2007; Otte, 2005).

Having performed a planned behavior, immediate human and environmental reactions trigger post-actional evaluation and learning. Insofar as performing the lifestyle results in the intended or unintended outcomes of action A_i as time $t_i \in T \coloneqq (t_1,...,t_I)$ passes by, the utilities of human reaction $H_{i,k}(A_i, t_0 + t_i)$ and environmental reaction $E_{i,k}(A_i, t_0 + t_i)$ are

compared. Discrepancies between housing attributes, and perceived built, ecological and social residential environments, reflect the fit into a desired, preferred, or practiced lifestyle standard (cf. Brun and Fagnani, 1994; Walker and Li, 2007). The fit of a preferred lifestyle with socio-cultural and situational components of housing predicts residential satisfaction (Ge and Hokao, 2006). In the evaluation phase, action outcomes are compared with the desired or practiced lifestyle, and immediate behavior is adapted to the motivational bias. The actualization of lifestyle and the relational human-environment system are then induced through sustainability learning into a secondary feedback loop. If the utility of long-term human and environmental outcomes $u(A_{i,k}, H_{i,k}, E_{i,k}, t_0 + T)$ is positive, motivation is induced to maintain the lifestyle, whereas negative processing tends toward lifestyle changes. Residential mobility is likely if the utility of moving outweighs its transaction costs (van Ommeren and van Leuvensteijn, 2005). For example, the vast migration of non-Hispanic whites and blacks out of El Paso, Texas was influenced by a mismatch of lifestyle, education, jobs, ethnicity, language preference, or place of birth (Fernandez, Howard and Amastae, 2007). If transaction costs are outweighed by dissatisfaction or better alternatives, then new needs, wishes, and desires may motivate residential mobility.

2.4 Discussion

Current resource depletion and pollutant emissions causing global warming, ozone layer depletion, and other adverse effects in air, soil, and water are sustainability challenges. Many ecological problems such as resource depletion, environmental pollution, or global warming result from inefficient technologies and lifestyles in urban systems. Lifestyles are a key component in the seven fields of transition of urban services and behavioral patterns. Much lifestyle research has focused on the role of habit, habitus, and distinction. Other symbolic motives, like social affiliation and identification, have been largely neglected. We found well-elaborated fields of transition but also blind spots in lifestyle research on urban systems. Little is also known on the regulative impacts of lifestyles, the matching of usages and users, and non-residential lifestyles in mixed urban districts. Empirical studies on feedback loops of lifestyles are also tasks for future research to be clarified in detail.

Urban living is generally but not always more sustainable than rural living due to higher efficiency in land-use, infrastructure, and ecosystems. In Sweden however, the most wasteful

energetic lifestyles are found in rich urbanite households (Carlsson-Kanyama, Engström and Kok, 2005). Socio-demographic trends and inefficient strategies against the coupling of wealth and energy use might even hinder voluntary restraint. Action programs, pilot regions, feebates, and internalization of external costs can help to prevent undesirable system dynamics (cf. Martinuzzi and Steurer, 2003; Peters *et al*., 2008; Scholz *et al*., 2004).

A capabilities approach is needed in which wealth, income, and social status are decoupled from access and resource flows (cf. Rawls, 1999; Sen, 2001). Therein, urban planning can learn from an enhanced management of ecological system limits (Laws *et al*., 2004). A key task is how to motivate key stakeholders to offer sustainable urban environments by shaping the situational and socio-cultural submatrices. The danger is that investors, entrepreneurs, and executives are buying into the commodity ideology, making it a self-fulfilling prophecy (Schrage, 2007). This may create social inequality, marginalization of underprivileged residents, and socio-structural ghettoization. Collective tasks of sustainability interventions in urban systems require sustainability learning through interdisciplinary and transdiscipinary action (Scholz *et al*., 2006). This may help realize the sustainable ecological and social settings that will effectively pay off in the long run.

2.5 Conclusion

The application of human-environment systems allows for a more thorough interdisciplinary understanding of lifestyles. This becomes possible when referring to the Lewinian field theory and defining lifestyles as a cognitive-behavioral function of human and environmental matrices. They are substantiated by psychological and sociological submatrices. Managing the incentive-barrier structures, which are linked to sustainable lifestyle settings, is crucial for enabling sustainable urban living. Many urban managers, however, who work as agents of planned change, concentrate on technological systems. The urban design of lifestyle settings may aid in structuring improvements on the material and cultural spheres that eliminate system disparities. The proposed conceptualization of lifestyles can be utilized for structuring sustainable transitions of urban and regional systems. This contribution may provide a useful planning template for urban managers when designing sustainability interventions.

2.6 Acknowledgements

This research project is funded by a grant from the Swiss National Science Foundation (SNSF) as part of its National Research Programme (NRP) 54 “Sustainable Development of the Built Environment” (Project Number 405440-107075/1). The authors thank Ulrich Kriese, Daniel Lehmann Pollheimer, Michael Stauffacher, Rainer Gabriel and Peter de Haan for helpful suggestions; and Sandro Bösch for his graphical support on Figure 2.3.

2.7 References

Adler, A. (1925) *The practice and theory of individual psychology*. London: Routledge & Kegan Paul Ltd.

Ærø, T. (2006) “Residential choice from a lifestyle perspective”, *Housing, Theory and Society* 23(2):109-130.

Aini, M.S., Fakhru'l-Razi, A., Lau, S.M. and A.H. Hashim (2002) “Practices, attitudes and motives for domestic waste recycling”, *International Journal of Sustainable Development and World Ecology* 9(3):232-238.

Ajzen, I. (1991) “The theory of planned behaviour”, *Organizational Behavior and Human Decision Processes* 50(2):179-211.

Ash, S., Reeves, M., Bauer, J., Dover, T., Vivanti, A., Leong, C., Sullivan, T.O. and S. Capra (2006) “A randomised control trial comparing lifestyle groups, individual counselling and written information in the management of weight and health outcomes over 12 months”, *International Journal of Obesity* 30(10):1557-1564.

Baldassare, M. (1992) “Suburban communities”, *Annual Review of Sociology* 18:475-494.

Barr, S. and A. Gilg (2006) “Sustainable lifestyles: Framing environmental action in and around the home”, *Geoforum* 37(6):906-920.

Bennett, A. (1999) “Subcultures or neo-tribes? Rethinking the relationship between youth, style and musical taste”, *Sociology - The Journal of the British Sociological Association* 33(3):599-617.

Billari, F.C. and A.C. Liefbroer (2007) “Should I stay or should I go? The impact of age norms on leaving home”, *Demography* 44(1):181-198.

Blasius, J. and J. Friedrichs (2008) “Lifestyles in distressed neighborhoods: A test of Bourdieu's 'taste of necessity' hypothesis”, *Poetics* 36(1):24-44.

Blasius, J. and J. Winkler (1989) “Gibt es die 'feinen Unterschiede'? Eine empirische Überprüfung

der Bourdieuschen Theorie" (What is the meaning of distinction? An empirical examination of Bourdieu theory), *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 41(1):72-94.

Blokland, T. (2008) "'You got to remember you live in public housing': Place-making in an American housing project", *Housing, Theory and Society* 25(1):31-46.

Bonaiuto, M., Aiello, A., Perugini, M., Bonnes, M. and A.P. Ercolani (1999) "Multidimensional perception of residential environmental quality and neighbourhood attachment in the urban environment", *Journal of Environmental Psychology* 19(4):331–352.

Bourdieu, P. (2007) *Distinction: A social critique of the judgement of taste*. Cambridge, MA: Harvard University Press.

Bourdieu, P. and L.J.D. Wacquant (1992) *An invitation to reflexive sociology*. Chicago, IL: Chicago University Press.

Bröder, A. and S. Schiffer (2006) "Adaptive flexibility and maladaptive routines in selecting fast and frugal decision strategies", *Journal of Experimental Psychology: Learning, Memory, and Cognition* 32(4):904-918.

Brown, P., McCormick, S., Mayer, B., Zavetoski, S., Morello-Frosch, R., Gasior-Altman, R. and L. Senier (2006) "'A lab of our own': Environmental causation of breast cancer and challenges to the dominant epidemiological paradigm", *Science, Technology, & Human Values* 31(5):499-536.

Brownson, R.C., Eyler, A.A., King, A.C, Brown, D.R., Shyu, Y.L. and J.F. Sallis (2000) "Patterns and correlates of physical activity among US women 40 years and older", *American Journal of Public Health* 90(2):264-270.

Brun, J. and J. Fagnani (1994) "Lifestyles and locational choices trade-offs and compromises: A case-study of middle-class couples living in the Ile-de-France Region", *Urban Studies* 31(6):921-934.

Camagni, R., Gibelli, M.C. and P. Rigamonti (2002) "Urban mobility and urban form: The social and environmental costs of different patterns of urban expansion", *Ecological Economics* 40(2):199-216.

Cao, X. and P.L. Mokhtarian (2005) "How do individuals adapt their personal travel? A conceptual exploration of the consideration of travel-related strategies", *Transport Policy* 12(3):199-206.

Carlsson-Kanyama, A., Engström, R. and R. Kok (2005) "Indirect and direct energy requirements of city households in Sweden: Options for reduction, lessons from modelling", *Journal of Industrial Ecology* 9(1-2):221-235.

Chaney, D. (1996) *Lifestyles*. London: Routledge.

Costanza, R. (2003) "Social goals and the valuation of natural capital", *Environmental Monitoring*

and Assessment 86(1-2):19-28.

Christakis, N.A. and J.H. Fowler (2007) "The spread of obesity in a large social network over 32 years", *New England Journal of Medicine* 357(4):370-379.

Cook, D.J., Greengold, N.L., Ellrodt, A.G. and S.R. Weingarten (1997) "The relation between systematic reviews and practice guidelines", *Annals of Internal Medicine* 127(3):210-216.

Cotterell, J.L. (1991) "The emergence of adolescent territories in a large urban leisure environment", *Journal of Environmental Psychology* 11(1):25-41.

Curwell, S. and I. Cooper (1998) "The implications of urban sustainability", *Building Research & Information* 26(1):17-28.

de Haan, P., Mueller, M.G. and A. Peters (2005) "Does the hybrid Toyota Prius lead to rebound effects? Analysis of size and number of cars previously owned by Swiss Prius buyers", *Ecological Economics* 58(3):592-605.

de Vos, E. (2005) "Public parks in Ghent's city life: From expression to emancipation?", *European Planning Studies* 13(7):1035-1061.

Diaz-Bone, R. (2003) "Milieumodelle und Milieuinstrumente in der Marktforschung" (Milieu models and milieu instruments in market research), *Sozialwissenschaften und Berufspraxis* 26(4):365-380.

Dowda, M., Ainsworth, B.E., Addy, C.L., Saunders, R. and W. Riner (2003) "Correlates of physical activity among US young adults, 18 to 30 years of age, from NHANES III", *Annals of Behavioral Medicine* 26(1):15-23.

Durkheim, E. (1965) *The division of labor in society*. New York, NY: The Free Press.

Elias, N. (1991) *The society of individuals*. Oxford: Basil Blackwell.

Esser, H. (1996) "Die Definition der Situation" (The definition of the situation), *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 48(1):1-34.

Fernandez, L., Howard, C. and J. Amastae (2007) "Education, race/ethnicity and out-migration from a border city", *Population Research and Policy Review* 26(1):103-124.

Festinger, L. (1964) *Conflict, decision, and dissonance* (Stanford studies in psychology: Vol. 3). Stanford, CA: Stanford University.

Fiske, S.T. and S.E. Taylor (2008) *Social cognition: From brains to culture* (3rd ed.). New York, NY: McGraw-Hill.

Florida, R. (2005) *Cities and the creative class*. Oxford: Routledge.

Foster, J.D., Campbell, W.K., and J.M. Twenge (2003) "Individual differences in narcissism: Inflated self-views across the lifespan and around the world", *Journal of Research in*

Personality 37(6):469-486.

Fowler, J.H. and N.A. Christakis (2008) "Dynamic spread of happiness in a large social network: longitudinal analysis over 20 years in the Framingham Heart Study", *British Medical Journal* 337:a2338.

Frank, L.D., Saelens, B.E., Powell, K.E. and J.E. Chapman (2007) "Stepping towards causation: Do built environments or neighborhood and travel preferences explain physical activity, driving, and obesity?", *Social Science and Medicine* 65(9):1898-1914.

Franke, T. (2007) "Neighbourhood management for integrative district development", *Innovation - The European Journal of Social Science Research* 20(2):119-132.

Frumkin, H. (2003) "Healthy places: Exploring the evidence", *American Journal of Public Health* 93(9):1451-1456.

Galea, S. and D. Vlahov (2005) "Urban health: Evidence, challenges, and directions", *Annual Review of Public Health* 26:341-365.

Ge, J. and K. Hokao (2006) "Research on residential lifestyles in Japanese cities from the viewpoints of residential preference, residential choice and residential satisfaction", *Landscape and Urban Planning* 78(3):165-178.

Genjo, K., Tanabe, S., Matsumoto, S., Hasegawa, K. and H. Yoshino (2005) "Relationship between possession of electric appliances and electricity for lighting and others in Japanese households", *Energy and Buildings* 37(3):259-272.

Georg, W. (1998) *Soziale Lage und Lebensstil: Eine Typologie* (Social position and lifestyle: A typology). Opladen: Leske und Budrich.

Gobster, P.H. (2005) "Recreation and leisure research from an active living perspective: Taking a second look at urban trail use data", *Leisure Sciences* 27(5):367–383.

Gollwitzer, P.M. (1996) "The volitional benefits of planning", pp. 287-312 in Gollwitzer, P.M. and J.A. Bargh (eds.), *The psychology of action: Linking cognition and motivation to behavior*. New York, NY: Guilford Press.

Gordon-Larsen, P., Nelson, M.C., Page, P. and B.M. Popkin (2006) "Inequality in the built environment underlies key health disparities in physical activity and obesity", *Pediatrics* 117(2):417-424.

Greenberg, M. (2000) "Branding cities: A social history of the urban lifestyle magazine", *Urban Affairs Review* 36(2):228-263.

Greening, L.A. and H.T. Jeng (1994) "Life-cycle analysis of gasoline expenditure patterns", *Energy Economics* 16(3):217-228.

Hansmann, R., Bernasconi, P., Smieszek, T., Loukopoulos, P. and R.W. Scholz (2006)

"Justifications and self-organization as determinants of recycling behavior: The case of used batteries", *Resources, Conservation and Recycling* 47(2):133-159.

Harrison, R.A., Gemmell, I. and R.F. Heller (2007) "The population effect of crime and neighbourhood on physical activity: an analysis of 15 461 adults", *Journal of Epidemiology and Community Health* 61(1):34-39.

Harth, A., Herlyn, U. and G. Scheller (1998) "Segregation in eastern German cities: Gentrification, downgrading of large estates, and suburbanization", *Journal of Housing and the Built Environment* 13(4):421-437.

Haworth, J.T. and A.J. Veal (2004) "Introduction", pp. 1-11 in Haworth, J.T. and A.J. Veal (eds.), *Work and Leisure*. New York, NY: Routledge.

Helbrecht, I. and J. Pohl (1995) "Differentiation of lifestyles: New challenges to social geography in urban research", *Geographische Zeitschrift* 83(3-4):222-237.

Helderman, A.C., Mulder, C.H. and M. van Ham (2004) "The changing effect of home ownership on residential mobility in the Netherlands, 1980-98", *Housing Studies* 19(4):601–616.

Hendrickson, D., Smith, C. and N. Eikenberry (2006) "Fruit and vegetable access in four low-income food deserts communities in Minnesota", *Agriculture and Human Values* 23(3):371-383.

Hertwich, E.G. (2005) "Consumption and industrial ecology", *Journal of Industrial Ecology* 9(1-2):1-5.

Hoek, A.C., Luning, P.A., Stafleu, A. and C. de Graaf (2004) "Food-related lifestyle and health attitudes of Dutch vegetarians, non-vegetarian consumers of meat substitutes, and meat consumers", *Appetite* 42(3):265-272.

Holden, M., Roseland, M., Ferguson, K. and A. Perl (2008) "Seeking urban sustainability on the world stage", *Habitat International* 32(3):305–317.

Holt, D.B. (1997) "Poststructuralist lifestyle analysis: Conceptualizing the social patterning of consumption in postmodernity", *Journal of Consumer Research* 23(4):326-350.

Hong, Y.Y., Morris, M.W., Chiu, C.Y. and V. Benet-Martínez (2000) "Multicultural minds: A dynamic constructivistic approach to culture and cognition", *American Psychologist* 55(7):709-720.

Hou, L., Ji, B.T., Blair, A., Dai, Q., Gao, Y.T. and W.H. Chow (2004) "Commuting physical activity and risk of colon cancer in Shanghai, China", *American Jorunal of Epidemiology* 160(9):860-867.

Hoyer, W.D. and D.J. MacInnis (2007) *Consumer behavior* (4th ed.). Boston, MA: Houghton Mifflin Company.

Hoyman, M. and C. Faricy (2009) "It takes a village: A test of the creative class, social capital, and human capital theories", *Urban Affairs Review* 44(3):311-333.

Huijbregts, M.A.J., Hellweg, S., Frischknecht, R., Hungerbuehler, K. and A.J. Hendriks (2008)

"Ecological footprint accounting in the life cycle assessment of products", *Ecological Economics* 64(4):798-807.

Hull, C.L. (1952) *A behavior system*. New Haven, CT: Yale University Press.

Jurj, A.L., Wen, W., Gao, Y.T., Matthews, C.E., Yang, G., Li, H.L., Zheng, W. and X.O. Shu (2007) "Patterns and correlates of physical activity: A cross-sectional study in urban Chinese women", *BMC Public Health* 7(213):1-11.

Kahneman, D. and A. Tversky (1979) "Prospect theory: An analysis of decision under risk", *Econometrica* 47(2):261-291.

Kalish, Y. and G. Robins (2006) "Psychological predispositions and network structure: The relationship between individual predispositions, structural holes and network closure", *Social Networks* 28(1):56-84.

Karsten, L. (2003) "Family gentrifiers: Challenging the city as a place simultaneously to build a career and to raise children", *Urban Studies* 40(12):2573-2584.

Koellner, T. and O.J. Schmitz (2006) "Biodiversity, ecosystem function, and mitigation of investment risk", *BioScience* 56(12):977-985.

Kohler, N. (1999) "The relevance of Green Building Challenge: an observer's perspective", *Building Research & Information* 27(4/5):309-320.

Kohler, N. (2002) "The relevance of BEQUEST: an observer's perspective", *Building Research & Information* 30(2):130-138.

Kohler, N. (2008) "Cultural issues for a sustainable built environment", pp. 83-108 in Cole, R.J. and R. Lorch (eds.), *Buildings, culture and environment: Informing local and global practices* (2nd ed.). Oxford: Blackwell Publishing Inc.

Kriese, U. and R.W. Scholz "*Lifestyle ideas of home builders and housing investors in and around the 20th century - Views of a conservative branch*", Manuscript submitted for publication.

Lam, S.P. (2006) "Predicting intention to save water: Theory of planned behavior, response efficacy, vulnerability, and perceived efficiency of alternative solutions", *Journal of Applied Social Psychology* 36(11):2803-2824.

Lang, D.J., Binder, C.R., Scholz, R.W., Schleiss, K. and B. Stäubli (2006) "Impact factors and regulatory mechanisms for material flow management: Integrating stakeholder and scientific perspectives - The case of bio-waste delivery", *Resources, Conservation and Recycling* 47(2):101-132.

Lanzendorf, M. (2002) "Mobility styles and travel behavior: Application of a lifestyle approach to leisure travel", *Transportation Research Record* 1807:163-173.

Latham, A. (2003) "Urbanity, lifestyle and making sense of the new urban cultural economy: Notes

from Auckland, New Zealand", *Urban Studies* 40(9):1699-1724.

Laws, D., Scholz, R.W., Shiroyama, H., Susskind, L., Suzuki, T. and O. Weber (2004) "Expert views on sustainability and technology implementation", *International Journal of Sustainable Development and World Ecology* 11(3):247-261.

Lee, P. and A. Murie (1999) "Spatial and social divisions within British cities: beyond residualisation", *Housing Studies* 14(5):625-640.

Lewin, K. (1951) *Field theory in social science*. New York, NY: Harper.

Limtanakool, N., Schwanen, T. and M. Dijst (2009) "Developments in the Dutch urban system on the basis of flows", *Regional Studies* 43(2):179-196.

Lindén, A.L. and A. Carlsson-Kanyama (2003) "Environmentally friendly disposal behaviour and local support systems: lessons from a metropolitan area", *Local Environment* 8(3):291-301.

Loukopoulos, P., Jakobsson, C., Garling, T., Schneider, C.M. and S. Fujii (2004) "Car-user responses to travel demand management measures: Goal setting and choice of adaptation alternatives", *Transportation Research D* 9(4):263-280.

Luke, D.A. and J.K. Harris (2007) "Network analysis in public health: History, methods, and applications", *Annual Review of Public Health* 28:69-93.

Maderthaner, W. and L. Musner (2003) "Outcast Vienna 1900: The politics of transgression", *International Labor and Working-Class History* 64(1):25-37.

Manning, A. and B. Petrongolo (2004) *The part time pay penalty*. London: DTI Women and Employment Unit.

Marcketti, S.B. and L.S. Niehm (2006) "An exploratory study of lifestyle entrepreneurship and its relationship to life quality", *Industrial and Organizational Psychology* 34(3):241-259.

Margareta-Eriksson, K., Westborg, C.J. and M.C. Eliasson (2006) "A randomized trial of lifestyle intervention in primary healthcare for the modification of cardiovascular risk factors", *Scandinavian Journal of Public Health* 34(5):453-461.

Martinuzzi, A. and R. Steurer (2003) "The Austrian strategy for sustainable development: process review and policy analysis", *European Environment* 13(5):269-287.

Matthews, C.E., Hebert, J.R., Ockene, I.S., Saperia, G. and P.A. Merriam (1997) "Relationship between leisure-time physical activity and selected dietary variables in the Worcester Area Trial for Counseling in Hyperlipidemia", *Medicine and Science in Sports and Exercise* 29(9):1199-1207.

McGranahan, D. and T. Wojan (2007) "Recasting the creative class to examine growth processes in rural and urban counties", *Regional Studies* 41(2):197-216.

McDade, T.W. (2001) "Lifestyle incongruity, social integration, and immune function in Samoan

adolescents", *Social Science and Medicine* 53(10):1351-1362.

McKee, K. and V. Cooper (2008) "The paradox of tenant empowerment: Regulatory and liberatory possibilities", *Housing, Theory and Society* 25(2): 132-146.

Merrill, J., Caldwell, M., Rockoff, M.L., Gebbie, K., Carley, K.M. and S. Bakken (2008) "Findings from an organizational network analysis to support local public health management", *Journal of Urban Health - Bulletin of the New York Academy of Medicine* 85(4):572-584.

Michman, R.D., Mazze, E. and A.J. Greco (2003) *Lifestyle marketing: Reaching the new American consumer*. Westport, CT: Praeger.

Mischel, W. (1981) *Introduction to personality* (3rd ed.). New York, NY: Holt, Rinehart and Winston.

Mulder, C.H. (2007) "The family context and residential choice: a challenge for new research", *Population, Space and Place* 13(4):265–278.

Musgrove, P. (1988) "Basic food consumption in northeast Brazil: Effects of income, price, and family size in metropolitan and rural areas", *Food and Nutrition Bulletin* 10(1):29-37.

National Statistics (2005) *Social trends*. London: Stationery Office. http://www.statistics.gov.uk (accessed March 07, 2009).

Oettingen, G. and P.M. Gollwitzer (2000) "Goal setting and goal implementation", *Zeitschrift für Psychologie* 208(3/4):406-430.

Onnela, J.P, Saramäki, J., Hyvönen, J., Szabó, G., Lazer, D., Kaski, K., Kertész, J. and A.L. Barabási (2007) "Structure and tie strengths in mobile communication networks", *Proceedings of the National Academy of Sciences of the USA* 104(18):7332-7336.

Ornetzeder, M., Hertwich, E.G., Hubacek, K., Korytarova, K. and W. Haas (2008) "The environmental effect of car-free housing: A case in Vienna", *Ecological Economics* 65(3):516–530.

Otte, G. (2005) „Hat die Lebensstilforschung eine Zukunft? Eine Auseinandersetzung mit aktuellen Bilanzierungsversuchen" (Is there a future for lifestyle research? A discussion of recent appraisals), *Kölner Zeitschrift für Soziologie und Sozialpsychologie* 57(1):1-31.

Park, R.E., Burgess, E.W. and R.D. McKenzie (1974) *The city: Suggestions for investigation of human behavior in the urban environment* (7th ed.). Chicago, IL: The University of Chicago Press.

Payne-Sturges, D. and G.C. Gee (2006) "National environmental health measures for minority and low-income populations: Tracking social disparities in environmental health", *Environmental Research* 102(2):154-171.

Peters, A., Mueller, M.G., de Haan, P. and R.W. Scholz (2008) "Feebates promoting energy-efficient cars: Design options to address more consumers and possible counteracting effects", *Energy Policy* 36(4):1355-1365.

Pitsavos, C., Panagiotakos, D.B., Lentzas, Y. and C. Stefanadis (2005) "Epidemiology of leisure-time physical activity in socio-demographic, lifestyle and psychological characteristics of men and women in Greece: The ATTICA Study", *BMC Public Health* 5(37):1-9.

Plummer, J.T. (1974) "The concept and application of life style segmentation", *Journal of Marketing* 38(1):33-37.

Popkin, B.M., Duffey, K. and P. Gordon-Larsen (2005) "Environmental influences on food choice, physical activity and energy balance", *Physiology and Behavior* 86(5):603-613.

Rawls, J. (1999) *A theory of justice* (2nd ed.). Oxford: Oxford University Press.

Rogers, E.M. (2003) *Diffusion of innovations* (5th ed.). New York, NY: Free Press.

Rojas, R.S. and P.H. Metoyer (1995) "The Mexican American female worker: Perspectives on gender and culture in the workplace", *Journal of Social Behavior and Personality* 10(6):163-178.

Rosenthal, R. (1991) "Meta-analysis: a review", *Psychosomatic Medicine* 53(3):247-271.

Rowlands, R. and C.M. Gurney (2001) "Young peoples' perceptions of housing tenure: A case study in the socialization of tenure prejudice", *Housing, Theory and Society* 17(3):121–130.

Ruel, M.T., Haddad, L. and J.L. Garret (1999) "Some urban facts of life: Implications for research and policy", *World Development* 27(11):1917-1938.

Sallis, J.F., Cervero, R.B., Ascher, W., Henderson, K.A., Kraft, M.K. and J. Kerr (2006) "An ecological approach to creating active living communities", *Annual Review of Public Health* 27(1):297–322.

Sanne, C. (2002) "Willing consumers - or locked-in? Policies for a sustainable consumption", *Ecological Economics* 42(1-2):273–287.

Sauberzweig, D. (1996) "The future of the city - Problems and perspectives", *Interdisciplinary Science Reviews* 21(4):373-384.

Saunders, P.R. (2004) *Social theory and the urban question* (Routledge library editions: the city) (2nd ed.). Florence, KY: Routledge Chapman & Hall.

Scholz, R.W. (1987) *Cognitive strategies in stochastic thinking*. Dordrecht: Reidel.

Scholz, R.W. and C.R. Binder (2004) "Principles of Human-Environment Systems (HES) research", pp. 791-796 in Pahl-Wostl, C., Schmidt, S., Rizzoli, A.E. and A.J. Jakeman (eds.), *Complexity and integrated resources management transactions of the 2nd biennial meeting of the International Environmental Modelling and Software Society* (Vol. 2). Osnabrück: ZUK. http://www.iemss.org/iemss2004/ (accessed February 02, 2009).

Scholz, R.W., Bösch, S., Koller, T., Mieg, H.A. and J. Stünzi (eds.) (1996) *Industrieareal Sulzer-Escher Wyss: Umwelt und Bauen - Wertschöpfung durch Umnutzung* (ETH-UNS

Fallstudie 1995) (Industrial area Sulzer-Escher Wyss: Environment and construction - Added value through re-use in construction [ETH-UNS case study 1995]). Zurich: vdf.

Scholz, R.W., Bösch, S., Mieg, H.A. and J. Stünzi (eds.) (1997) *Zentrum Zürich Nord: Stadt im Aufbruch* (ETH-UNS Fallstudie 1996) (Center Zurich North: A city on the move - Elements for a sustainable urban development [ETH-UNS case study 1996]). Zurich: vdf.

Scholz, R.W., Lang, D.J., Wiek, A., Walter, A.I. and M. Stauffacher (2006) "Transdisciplinary case studies as a means of sustainability learning: Historical framework and theory", *International Journal of Sustainability in Higher Education* 7(3):226-251.

Scholz, R.W., Stauffacher, M., Bösch, S. and P. Krütli (2004) *Mobilität und zukunftsfähige Stadtentwicklung: Freizeit in der Stadt Basel* (ETH-UNS Fallstudie 2003) (Mobility and future-oriented urban development: Leisure in the city of Basel [ETH-UNS case study 2003]). Zurich: Rüegger und Pabst Verlag.

Scholz, R.W. and O. Tietje (2002) *Embedded case study methods: integrating quantitative and qualitative knowledge*. Thousand Oaks, CA: Sage.

Schrage, M. (2007) "The myth of commoditization", *MIT Sloan Management Review* 48(2):10-14.

Schulz, T.F. (2007) *Intermediate steps towards the 2000-Watt society in Switzerland: an energy-economic scenario analysis* (Dissertation Nr. 17314). Zurich: ETH.

Selvaratnam, D.P. and P.B. Tin (2007) "Lifestyle of the elderly in rural and urban Malaysia", *Healthy Aging and Longevity* 1114(1):317-325.

Sen, A. (2001) *Development as freedom*. Oxford: Oxford University Press.

Shapiro, G.G. and J.W. Stout (2002) "Childhood asthma in the United States: urban issues", *Pediatric Pulmonology* 33(1):47-55.

Sidin, S.M., Rahman, M.K.A., Rashid, M.Z.A., Othman, M.N., and A.Z. Abu Bakar (2008) "Effects of social variables on urban children's consumption attitude and behavior intentions", *Journal of Consumer Marketing* 25(1):7-15.

Simmel, G. (1900) *Philosophie des Geldes* (The philosophy of money). Leipzig: Duncker & Humblot Verlag.

Simmel, G. (1957) "Fashion", pp. 294-323 in Levine, D.N. (ed.), *On individuality and social forms*. Chicago, IL: The University of Chicago Press.

Singh, B. and R.K. Patel (1984) "Effect of socio-economic parameters on consumption patterns of milk and milk products", *Asian Journal of Dairy Research* 3(4):217-226.

Smil, V. (2008) *Energy in nature and society: General energetics of complex systems*. London: The MIT Press.

Smith, K.P. and N.A. Christakis (2008) "Health and social networks", *Annual Review of Sociology* 34:405-429.

Sobel, M. (1981) *Lifestyle and social structure: Concepts, definitions, analysis*. New York, NY: Academic Press.

Steg, L. (2005) "Car use: lust and must. Instrumental, symbolic and affective motives for car use", *Transportation Research A* 39(2-3):147-162.

Stokols, D. (1992) "Establishing and maintaining healthy environments: Toward a social ecology of health promotion", *American Psychologist* 47(1):6–22.

Sugiyama, T. and C. Ward Thompson (2007) "Outdoor environments, activity and the well-being of older people: conceptualising environmental support", *Environment and Planning A* 39(8):1943-1960.

Tajfel, H. and J.C. Turner (1986) "The social identity theory of intergroup behaviour", pp. 7-24 in Worchel S. and W.G. Austin (eds.), *The psychology of intergroup relations*. Chicago, IL: Nelson-Hall.

Tallon, A.R. and R.D.F. Bromley (2004) "Exploring the attractions of city centre living: Evidence and policy implications in British cities", *Geoforum* 35(6):771–787.

The American Heritage Dictionaries (2000) *The American Heritage Dictionary of the English Language* (4th ed.). Boston, MA: Houghton Mifflin Company.

Throne-Holst, H., Stø, E. and P. Strandbakken (2007) "The role of consumption and consumers in zero emission strategies", *Journal of Cleaner Production* 15(13-14):1328-1336.

Topalov, C. (2003) "'Traditional working-class neighborhoods': An inquiry into the emergence of a sociological model in the 1950s and 1960s", *Osiris* 18:212-233.

Tountas, Y., Manios, Y., Dimitrakaki, C. and C. Tzavara (2007) "Relationship between basic protective health behaviours and health related quality of life in Greek urban hospital employees", *International Journal of Public Health* 52(6):341–347.

Tulchinsky, T.H. and E.A. Varavikova (2009) *The new public health* (2nd ed.). Burlington, MA: Elsevier Academic Press.

Tversky, A. (2004) "Elimination by aspects: A theory of choice", pp. 463-492 in Shafir, E. (ed.), *Preference, belief, and similarity: Selected writings by Amos Tversky*. Cambridge, MA: The MIT Press.

Tversky, A. and D. Kahneman (2004) "Rational choice and the framing of decisions", pp. 593-619 in Shafir, E. (ed.), *Preference, belief, and similarity: Selected writings by Amos Tversky*. Cambridge, MA: The MIT Press.

United Nations Human Settlements Programme (UN-Habitat) (2007) *Tomorrow's crises today:*

The humanitarian impact of urbanisation. Nairobi: UN-Habitat.

United Nations Population Fund (UNFPA) (2007) *State of world population: Unleashing the potential of urban growth*. New York, NY: UNPF. http://www.unfpa.org/ (accessed October 20, 2008).

Urban Task Force (1999) *Towards an urban renaissance: Final report of the Urban Task Force*. London: E & FN Spon.

U.S. Departement of Health and Human Services (U.S. HHS) (1996) *Physical activity and health: A report of the surgeon general*. Atlanta, GA: CDC.

van de Coevering, P. and T. Schwanen (2006) "Re-evaluating the impact of urban form on travel patterns in Europe and North-America", *Transport Policy* 13(3):229-239.

van Ommeren, J. and M. van Leuvensteijn (2005) "New evidence of the effect of transaction costs on residential mobility", *Journal of Regional Science* 45(4):681-702.

Villard, L.C., Ryden, L. and A. Stahle (2007) "Predictors of healthy behaviours in Swedish school children", *European Journal of Cardiovascular Prevention & Rehabilitation* 14(3):366-372.

Vyncke, P. (2002) "Lifestyle segmentation: From attitudes, interests and opinions, to values, aesthetic styles, life visions and media preferences", *European Journal of Communication* 17(4):445-463.

Walker, J.L. and J. Li (2007) "Latent lifestyle preferences and household location decisions", *Journal of Geographical Systems* 9(1):77–101.

Ward, K., Fagan, C., McDowell, L., Perrons, D. and K. Ray (2007) "Living and working in urban working class communities", *Geoforum* 38(2):312-325.

Weber, M. (1922) *Wirtschaft und Gesellschaft: Grundriss der verstehenden Soziologie* (Economy and society: An outline of interpretive sociology). Tübingen: Mohr.

Weber, C. and A. Perrels (2000) "Modelling lifestyle effects on energy demand and related emissions", *Energy Policy* 28(8):549-566.

Wells, W.D. (1974) "Life style and psychographics: Definitions, uses and problems", pp. 317-363 in Wells, W.D. (ed.), *Lifestyle and psychographics*. Chicago, IL: American Marketing Association.

Wilbur, J., Chandler, P.J., Dancy, B. and H. Lee (2003) "Correlates of physical activity in urban Midwestern Latinas", *American Journal of Preventive Medicine* 25(3):69-76.

Winlow, S. and S. Hall (2006) *Violent night: Urban leisure and contemporary culture*. Oxford: Berg Publishers.

Yarcheski, T.J., Mahon, N.E. and A. Yarcheski (2003) "Social support, self-esteem, and positive health practices of early adolescents", *Psychological Reports* 92(1):99-103.

Yu, Z. and D. Myers (2007) "Convergence or divergence in Los Angeles: Three distinctive ethnic patterns of immigrant residential assimilation", *Social Science Research* 36(1):254-285.

3 Sustainable property funds: financial stakeholders' views on sustainability criteria and market acceptance

Manuscript published as Bügl, R., Leimgruber, C., Hüni, G.R., & Scholz, R.W. (2009). Sustainable property funds: financial stakeholders' views on sustainability criteria and market acceptance. *Building Research & Information*, 37(3), 246-263.

Abstract

Sustainable property (real estate) funds (S-REFs) have started to enter international finance markets. An investigation in the German-speaking parts of Switzerland examined two key questions: (1) the sustainability criteria that institutional real estate investors and real estate fund (REF) suppliers regard as important for the market success of S-REFs; and (2) how they assess the market acceptance of such funds. Focus groups were conducted to define sustainability components for S-REFs from a market success perspective. A questionnaire study was then undertaken to assess the two key questions. Factor analysis identified four independent sustainability factors: (1) building materials and energy; (2) expenses, return, and flexibility; (3) green space design; and (4) landscape and natural ecology. In the factor analysis, the set of criteria relating to sustainable social infrastructure did not form an independent factor. In total, 76% of the responding institutional investors decided on an S-REF investment, and 38% reported accepting return shortfalls against the REF benchmark. The market acceptance of S-REFs by institutional investors depends on cognitive drivers, institutional context, age, and family status of investors. These results can inform the design of S-REFs, marketing strategies, and sustainability ratings.

Keywords: key financial stakeholders, market acceptance, responsible property investment, sustainability criteria, sustainable real estate funds

3.1 Introduction

Currently, societies are confronted with natural resource shortages, landscape and biodiversity depletion, and global climate change (Intergovernmental Panel on Climate Change (IPCC), 2007). Property (real estate) is a critical issue for sustainable development because of large shares of resource and energy consumption. In Western European countries, the share of total energy used for space heating and warm water supply and the related domestic CO2 emissions is almost 40% (Weber and Perrels, 2000). The type and amount of resource usage are largely influenced by the efficiency of technology supply and the lifestyle of users (Barr and Gilg, 2006). Moreover, resource usage depends on many factors, including household type, environmental awareness, normative pressure, learning experiences, and the price and availability of commodities (Johnson, 1980; Scholz and Binder, 2004; Weber and Perrels, 2000).

In the real estate sector, sustainability is affected by material extraction, product manufacturing and assembly, building structure, system maintenance, replacement, and waste disposition (Kibert, 2007, p. 595). In most cases, sustainability assessments only evaluate green performance and concentrate on technosphere and ecosphere (Cole, 1999; Hofstetter *et al*., 2000). This is done by a multitude of environmental assessment systems, planning tools, databases, and life cycle analysis tools, some of which are exclusively designed for buildings (e.g., Building Research Establishment Ltd (BRE), 2007; Guinée, 2002; Minergie, 2007, 2008; Schweizerischer Ingenieur- und Architektenverein (SIA), 2005). Several authors have argued that the sustainability of real estate projects must include resource usage, natural and socio-cultural systems, growth and economic demands (Cole, 2005). Sustainability assessments also need to integrate the valuesphere of decision-makers. Even though most sustainability assessments of real estate focus on ecological performance, it is important to remember that sustainability is a concept with a pronounced connotation of social living. The ‘need’ concept of the Brundtland definition (World Commission on Environment and Development (WCED), 1987) implies that the design of social infrastructure has to satisfy the needs of the present without compromising the ability of future generations to meet their own needs. Other authors emphasize social justice and the disintegrating effect of social exclusion from housing areas (Rawls, 1999; Voinov, 2008). To define social sustainability in built environments, there is an identified need for investments to stabilize urban systems (Sassen, 2001) or for freedom of choice that enables people to realize their capabilities (Sen, 2001).

Sustainable social infrastructure consists of goods, services and spatial structures that enable human systems to realize their capabilities without social inequality. Social sustainability is a core topic of designing built environments that are not overly complex but serve as a social facilitator and symbol that affect security or social segregation (Canter, 2008). This requires building assessment tools that assess built environments as complex socio-ecological systems (Lützkendorf and Lorenz, 2006; Moffat and Kohler, 2008; Pivo, 2008). Some lessons on how to do this can be learned from procedures that assess the sustainability of industries, investment funds and credit ratings (Koellner *et al*., 2005, 2007; Weber *et al*., 2008). For example, sustainable development in the real estate market can be supported by direct investments and finance products, which both contribute towards high-performance sustainable buildings (Kibert, 2007). However, a transfer of current developments and innovations to a set of pilot implementations of sustainable real estate funds (S-REFs) is still lacking. A definition of S-REFs should meet both the performance demands of financial institutions as well as the impacts of the real estate investment. The latter is focused on sustainability criteria which refer to impacts on ecology, society, and economy under the perspective of justice and system stability (Laws *et al*., 2004; WCED, 1987). Although there are several contributions towards a definition of social sustainability indicators (cf. Morosini *et al*., 2001), there is currently no standard system for social sustainability for the application of real estate investments. Thus, sustainable funds are needed that are accepted on the market and integrate ecological investment with the sustainability of social infrastructure.

A regional study in Switzerland forms the basis of this paper. Therefore, a brief overview of aspects of the Swiss real estate market is provided. The total asset volume of Swiss real estate stock is estimated to be about US$1436 billion (Wüest & Partner, 2006), from which only about 1.0% are stock-traded and 1.5% are invested in indirect real estate investment products (Credit Suisse (CS), 2006). About 0.8% of the total real estate stock value in Switzerland is traded in open-ended real estate fund (REF) products. Swiss real estate investment funds, which are authorized by the Swiss Federal Banking Commission, had a total asset volume of US$11.1 billion as of mid year 2005 (Swiss National Bank (SNB), 2007). Although it is a small domestic and ecological niche market, certification according to Minergie standards is rapidly growing in Switzerland. Still, this is only equivalent to about 0.5% of the total building stock (Minergie, 2008; Swiss Federal Statistical Office (SFSO), 2006).[11]

Many developments in real estate markets are driven by supply and demand relations (Di Pasquale and Wheaton, 1996). Recently, sustainable financial products and sustainable real estate have boomed compared with conventional markets (Koellner *et al*., 2005; Minergie, 2008). For the last decade, an average annual growth rate of about 30% was reported for sustainable financial products in Switzerland (Knoepfel and Specking, 2006). Investors have also become increasingly interested in sustainable real estate (Schmid-Schönbein and Flatz, 2005). This has been reinforced during the recent 2008 financial crisis with vulnerable populations and generally weakening housing markets in many metropolitan areas, when planners were advised to redesign programmes to promote sustainable home ownership (Immergluck, 2008). Some studies suggest that sustainable investments can lower risks, provide robust returns, and have environmental effects; they are also less prone to return shortfalls (Hughes, 1998). On the other hand, many investors expect return shortfalls when investing in sustainable funds. This indicates a gap between performance of sustainable investments and their perception by investors. Recently, sustainable real estate investment funds were listed on stock markets in Europe and the US (e.g., NYSE Euronext, 2007). To date, there are only minor activities centred on new S-REFs, and it has been suggested that sustainable real estate investments are not of particular interest to investors (Pivo and McNamara, 2005). However, frequent claims suggest that REFs are easier to manage, understand and compare with benchmarks. Accordingly, REFs are often perceived as portfolio risk reducers and economically sustainable investments (Clayton *et al*., 2007) that are suitable for portfolio diversification.

3.2 Research objectives and hypotheses

This study has three major objectives. First, it is to understand the preference structures of key financial stakeholders for sustainability criteria of REFs under the perspective of market success of such funds. Second, their views on sustainable social infrastructure are investigated. Third, the market acceptance of S-REFs by institutional investors is modelled using cognitive drivers, institutional context, and socio-demographic controls. Finally, data are sampled on the market acceptance of REF suppliers, target groups of S-REFs and alternative investment strategies for sustainable real estate. Figure 3.1 illustrates the procedure of the study, and Table 3.1 lists a description of the hypotheses.

3.2.1 Anticipated importance of sustainability criteria

One of the primary goals of investors is to maximize rates of return on their investment portfolios (cf. Koellner *et al.*, 2005). Accordingly, the role of sustainability criteria is examined within the framework condition of prospective market success of S-REFs (cf. Bell and Morse, 2008; Kahneman, 2003). One possible argument can be that economic and ecological criteria are more salient to key financial stakeholders than social ones when it comes to sustainable investment. Therefore, the hypothesis needs testing if social sustainability criteria are less dominant for key financial stakeholders (cf. Table 3.1, H_1).

3.2.2 Predictors for market acceptance: cognitive drivers

Blume (2006) found that successful municipal economic policies need a balanced mix of public management, real estate management, infrastructure investment, regional cooperation, and public–private partnerships. Sust-REFs are financial instruments that can foster sustainable development on such a local and regional level (cf. Margulis, 2002). Accordingly, it is examined if investors' market acceptance of S-REFs relies on an anticipated sustainability management effect for this investment (H_2).

Step	Focus groups	Questionnaire study	
Scope	**Generation of sustainability criteria**	**Anticipated importance of sustainability criteria**	**Market acceptance of sustainable real estate funds**
Key components	• Input: Criteria from SIA 112/1 standard for sustainable construction • Adding, merging, and deleting of sustainability components under the perspective of market success of sustainable real estate funds • Importance rating of sustainability components and selection of those most important for market success • Generation of facets for every retained sustainability component, definition of sustainability criteria	• Rating of sustainability criteria for their anticipated importance for the prospective market success of sustainable real estate funds • Finding latent sustainability views of key financial stakeholders on real estate funds • Developing sustainability scales from the viewpoint of key financial stakeholders	• Market acceptance ascertained by: o Decision to invest o Investment volume o Willingness to accept return shortfalls • Independent variables: o Cognitive drivers o Institutional context o Socio-demography • Additional behavioural finance data

Figure 3.1 Procedure of the study - basic modules

Table 3.1 Description of hypotheses

Hypothesis	Description
H_1: *Social sustainability criteria*	Whether key financial stakeholders view social sustainability as less important for the market success of sustainable real estate funds than ecological or economic sustainability
H_2: *Sustainability management effect*	Whether the investors' market acceptance of sustainable real estate funds depends on considering such funds as having positive effects on local and regional development
H_3: *Risk tolerance*	Whether the market acceptance of sustainable real estate funds by risk-tolerant investors is higher than for risk-averse investors
H_4: *Environmentalism*	Whether environmental anthropocentrism and apathy are negatively related to investors' market acceptance of sustainable real estate funds, whereas ecocentrism is a positive predictor
H_5: *Institutional context*	Whether the institutional context (such as assets under management, real estate fund investments, the type of company and the hierarchical level of investors) is related to the market acceptance of sustainable real estate funds by investors

The range of options of investment risk influences decisions (Vlaev *et al*., 2007). Langevoort (1996) has investigated why and when perceived risk influences the market acceptance of new finance instruments. As the market success of S-REFs is currently largely unknown, they might be perceived as risky investments. The third hypothesis needing investigation is on risk tolerance (H_3). The effect of risk tolerance on the market acceptance of S-REFs may have several implications. The first is whether risk-tolerant investors are prepared to hold portfolios at a higher risk (Corter and Chen, 2006) and therefore are more likely to decide in favour of S-REFs than risk-averse investors. Risk-tolerant investors may have higher risk premium expectations than risk-averse investors. This is the case if risk tolerance is related to a lower willingness of investors to accept return shortfalls. Similarly, Guiso *et al*. (1996) found that portfolio choices of private investors, confronted with income risk or risk of credit denial, are associated with reducing exposure to the avoidable risk of holding securities with uncertain returns.

Thompson and Barton (1994) defined anthropocentric, ecocentric, and apathetic attitudes towards the environment. Environmentally anthropocentric individuals consider quality of living to be dependent on an intact environment. But economic demands may outweigh the ecological motives of anthropocentric investors. For environmentally ecocentric people, nature is valuable and worthy of protection for its own sake. For environmentally apathetic individuals, ecological damage is non-existent or not severe, and environmental protection is perceived as unimportant or over the top. For this reason, it is tested whether environmentalism of investors affects their market acceptance of S-REFs (H_4).

3.2.3 Predictors for market acceptance: institutional context

Environmental behaviour seems to depend on environmental attitudes, but also on active social pressure. According to the principal-agent dilemma, one's employing institution serves as a normative social context affecting decisions (Sappington, 1991). Such social norms are socially expected modes of conduct (Ajzen, 1991). This causes individuals in an institutional setting to do what is expected of them by authorities. Intention to invest in stocks is further influenced by subjective norms, attitudes and past behaviour (East, 1993). Group-related processes influence decision-making concerning the riskiness of decisions (Florack and Hartmann, 2007). For this reason, it is investigated whether institutional context affects investors' market acceptance of S-REFs (H_5).

3.3 Methods

3.3.1 Focus groups

Two focus groups were conducted to define sustainability components for S-REFs that they considered important for the prospective market success. Focus group participants were institutional real estate investors, REF suppliers, sustainable financial experts, real estate assessment experts, and architects (n = 15). They were professionals in real estate or finance interested in green/responsible real estate investments or sustainable construction. A summary of SIA 112/1 was provided as input information (SIA, 2005). This is a standard document on sustainable construction edited by the Swiss Association of Engineers and Architects. It includes detailed performance descriptions on sustainable construction not segregated for building types. After merging, adding, or deleting, focus group participants ranked the half of the sustainability components they considered most important for the market success of S-REFs. The following eleven components were rated to be of highest importance for the market success of S-REFs and retained for the questionnaire study, while those written in parentheses were sorted out:

- Economic sustainability: attractiveness of the location; return; the basic structure of buildings; the cost of repair and restoration; the cost of maintenance (the supply of sustainable buildings; real estate portfolio; future framework conditions in law; the size of buildings; future development of the Swiss real estate market).

- Ecological sustainability: energy used for operation; building materials; soil; green areas (the supply of renewable energy; water balance; the energy used for construction; mobility).

- Social sustainability: well-being; community (public health; protection against dangers).

From the retained sustainability components, sustainability criteria for REFs were defined, which were used in the questionnaire study.

3.3.2 Questionnaire study

In July and August 2006, an e-mail-based questionnaire study was conducted. A convenience sample of n = 68 responding key financial stakeholders was used, with n_1 = 58 institutional real estate investors and n_2 = 10 REF suppliers (response rate = 49%). There was no overlap of respondents between focus groups and the e-mail-based questionnaire study. All respondents worked as professionals in German-speaking parts of Switzerland. Investors were eligible if they were currently responsible for investing in real estate or in real estate financial products on behalf of their employer. REF suppliers were eligible if they had developed REFs and were currently employed for supplying or managing REFs.

The sample consisted of 87% men and 13% women, with an average age of 46 years (standard deviation (SD) = 8.7). They worked in specialized divisions and were responsible for nine employees on average. Most of the investors (76%) were employed in pension funds, 12% in collective foundations, and 12% in other types of companies.

On the institutional level, the responding investors were employed in n_1 = 44 real estate investing institutions, consisting of 34 pension fund companies, four collective foundations, and six companies of other types. The sampled REF suppliers were employed in n_2 = 4 REF supplying institutions. The sampled pension fund companies together held about 20% of the Swiss employee benefit assets as of the end of 2005. Of these pension funds, 47% held assets that were of predominantly public ownership, and 53% held assets of predominantly private ownership. On average, pension funds had a liability coverage ratio (LCR) of 109% (SD = 14.2) at the end of 2005, with:

$$\text{LCR} = \left(\frac{\text{operative cash flow} - \text{cash dividends paid}}{\text{current liabilities}} \right)$$

On average, real estate investing institutions in which responding investors were employed at the time of the study held assets under management of about US$1.72 billion at the end of 2005 (cf. Table 3.2). The capital investment categories of the institutions employing responding investors were highest in bonds and other issues (34%), stocks (29%), and direct real estate investments (15%). A total of 12% of the assets under management were held in indirect real estate investments. On average, REFs accounted for about 3% of the institutions' assets under management. As the correlation of shares of capital investment categories with total value of assets under management shows, real estate investing institutions with higher assets under management tend to have a higher share of liquid funds and a lower share of direct real estate investments and stocks. The share of REF investments is not affected by the total value of assets under management. It was found that REF supplying companies offer four REFs on average. In total, they hold US$4.34 billion invested as funds' net assets on average.

3.3.3 Model variables

The importance of sustainability criteria for the market success of S-REFs and other cognitive drivers was answered on a seven-point rating scale (1 = unimportant/do not agree to 7 = very important/ strongly agree).

3.3.3.1 Dependent regression variables

Market acceptance of S-REFs was ascertained by a willingness to invest and an acceptance of return shortfalls of institutional real estate investors. A willingness to invest was ascertained by the investors' decision to invest in a newly launched S-REF (yes or no), and by investment volume in millions of Swiss francs (CHF), i.e. how much capital the respondent was willing to invest in S-REFs as the institution's representative. Acceptance of return shortfalls was ascertained by an item on whether the respondent is willing to accept return shortfalls when investing in S-REFs (yes or no), and an item on the maximum acceptable return shortfall in absolute percentage point difference compared with the benchmark. As the benchmark for REF investments in Switzerland, the SWX Immobilienfonds Index was used, covering about

CHF15.6 billion of real estate value (SWX Swiss Exchange, 2007; CS, 2006). The average annual return on REFs was 4.8% in 2005 and 3.2% in 2006 (CS, 2006, 2007). To test the social sustainability hypothesis, the respondents were also asked what per cent of economic, ecological, and social criteria should be contained in an S-REF.

3.3.3.2 Independent regression variables

As for cognitive drivers of market acceptance, the authors investigated the anticipated sustainability management effect of S-REFs, risk tolerance and environmentalism. The sustainability management effect focused on the effectiveness of S-REFs in steering local and regional sustainability. This scale included benefits for social infrastructure, reduction of construction waste, financial benefits for communities, health of dwellers, usage of regional renewable resources, reduction of crime rates, regional water management, and the domestic employment rate (Cronbach's α = 0.89). Risk tolerance was measured by the attractiveness of risky and difficult tasks, taking the lead in difficult situations, the attractiveness of the competition, making decisions, and the certainty of having competencies needed to overcome difficulties (Cronbach's α = 0.74). Four items each were used from Siegrist (1996) for environmental anthropocentrism (Cronbach's α = 0.64), environmental ecocentrism (Cronbach's α = 0.69), and environmental apathy (Cronbach's α = 0.43). From the sustainability factors, sustainability scales for REFs were derived. For institutional variables, assets under management, REF investments, type of company, and hierarchical level of respondents were used. Assets under management are the total financial assets managed in capital by the employing institution. For type of company, pension funds, collective foundations, and other types of companies were used. The hierarchical level of respondents was ascertained by the number of subordinates. Monetary data are reported in US$, using exchange rates as of 31 December 2005 (CHF1 = US$0.76). For socio-demographic control variables, the following were used: age, marriage, parenting, and annual household gross income. Full regression models were calculated using all of the independent variables presented here, and all of the insignificant independents were removed from parsimonious models. Assets under management and REF investments were retained as minimum controls.

Table 3.2 Mean shares of capital investment categories as of 31 December 2005 with reference to assets under management

Rank	Capital investment category	Share of assets under management	Monetary total value of shares		Correlation
		Mean (%)	Mean (US$, millions)	Standard deviation (US$, millions)	
1	Bonds and other issues	34	635	1075	0.15
2	Stocks	29	437	604	-0.21
3	Direct real estate investments	15	165	240	-0.25
4	Real estate investment foundations	7	137	612	0.06
5	Liquid funds	6	130	293	0.25
6	Real estate funds	3	45	93	-0.02
	thereof: 72% domestic real estate funds	2	33	74	0.00
	thereof: 28% foreign real estate funds	1	12	26	-0.03
7	Real estate stock corporations	2	43	146	0.15
	Other investments	7	152	252	0.10

Notes: n_1 = 44 real estate investing institutions. Monetary total values of shares are reported in US$ millions for each capital investment category with: Mean = $\sum_{n=1}^{n_1}$ (AUM * share of AUM) /n_1. Correlation refers to the total asset under management and the assets of the capital investment category.

3.3.4 Data analyses

Stata/SE10 and SPSS16 were used for data analyses (Field, 2000; Hamilton, 2006). All factor, consistency and regression analyses were performed on the basis of individual responses. For results on the institutional level, the mean of individual responses per institution was used. Internal consistency of sustainability scales was evaluated by Cronbach's α. This is a reliability coefficient for the scale score, which is a composite of single items (cf. Hamilton, 2006, pp. 318–319). For inferential statistics on mean comparisons, *t*-tests adjusted by variance ratio tests were used. In order to control for multiple testing, Bonferroni-corrected *p*-values were used where appropriate.

3.3.4.1 Factor analysis

Factor analysis was applied for finding sustainability factors from the perspective of key financial stakeholders, which are framed by market success of S-REFs. As rating scales were used, it was appropriate to use polychoric factor analysis. Polychoric correlation estimates the correlation between normally distributed continuous latent variables from observed ordinal variables. Principal factor extraction was used with orthogonal Varimax rotation. Factors

were retained according to the Kaiser–Guttman criterion, which means that they bind at least as much variance as the *z*-standardized input variables. Explained variance reflects which proportion of variance of the input variables is explained by the retained factors. The Kaiser–Meyer–Olkin test reports sampling adequacy, and should be greater than 0.5 if the sample of variables is adequate for factor analysis (Field, 2000, pp. 455–456). Communality is the degree to which a variable is explained by the retained factors. A variable without random variance would have a communality of one (Field, 2000, p. 432).

3.3.4.2 Regression analyses

Logistic regression was employed for binary dependents (Hosmer and Lemeshow, 2000). Binary logistic regression predicts which of two categories a person is likely to belong to (Field, 2000, pp. 163–164), given the information drawn from other items of the questionnaire. For monetary dependents, the Breusch–Pagan/Cook–Weisberg test showed the presence of heteroscedastic residuals. Thus, multiple ordinary least squares regression with replicated bootstrap standard errors was applied. R^2 and Pseudo-R^2 are reported for the goodness-of-fit of the regression models (Field, 2000, pp. 109, 181). R^2 reflects the percentage of the variation in the outcome that can be explained by the model, whereas Pseudo-R^2 is an extension for logistic regression models. For testing differences of percentages, negative binomial regression with replicated bootstrap standard errors was used (Hilbe, 2007).

3.4 Results

3.4.1 Key financial stakeholders' views on sustainability criteria for REFs

An overview on the anticipated importance of sustainability criteria for the market success of S-REFs is given in Figure 3.2. Including criteria of social sustainability in a full orthogonal factor analysis together with economic and ecological sustainability criteria did not provide appropriate sampling adequacy (mean = 0.38, SD = 0.17 for Kaiser–Meyer–Olkin; mean = 0.55, SD = 0.12 for communalities). As a consequence, it was decided to omit social sustainability criteria from the factor analysis. The sustainability criteria from the retained ecological and economic sustainability components showed appropriate sampling adequacy and acceptable communality (mean = 0.63, SD = 0.10 for Kaiser–Meyer–Olkin; mean = 0.54,

SD = 0.15 for communalities). Four orthogonal sustainability factors were found for REFs: (1) building materials and energy; (2) expenses, return, and flexibility; (3) green space design; and (4) landscape and natural ecology (cf. Figure 3.2). The explained variance achieved 83.1% of the sustainability criteria matrix. Together, the ecological factors of green space design together with landscape and natural ecology explained 32.3% of the sustainability criteria's variance. Average in-factor loadings of sustainability criteria achieved mean = 0.63 (SD = 0.13), and 97% off-factor loadings showed entries less than or equal to 0.30. These results suggest that these factors mirror the sustainability views of key financial stakeholders on REFs within the framework of anticipated market success.

A low pollutant-loading of building materials, low energy demand for warm water and a high proportion of renewable energy have above-average anticipated importance for the market success of S-REFs. The long life cycle of structural components, low costs for construction and conservation, and low maintenance constructions are expected to contribute considerably to the market success of S-REFs. Among others, responding key financial stakeholders attribute below-average importance to support for endemic plants on green areas and greening of roofs and facades.

Sustainable social infrastructure is positively correlated with expenses, return, and flexibility ($r = 0.51$, $p \leq 0.001$), green space design ($r = 0.52$, $p \leq 0.001$), and to landscape and natural ecology ($r = 0.47$, $p \leq 0.001$). As suspected by correlations with other sustainability scales, sustainable social infrastructure did not provide an orthogonal sustainability factor for REFs. Social criteria such as a convenient transportation network and considering future development received the highest importance ratings among all sustainability criteria. Daylight penetration in the building as well as well-being and feeling secure are likewise viewed as important for the market success of S-REFs. Together with the anticipated importance of social mixture of dwellers, the support for endemic plants on green areas and the greening of roofs and facades are expected to have the lowest weight for the prospective market success of S-REFs among the investigated set of sustainability criteria.

As presented in Figure 3.2, the sustainability scales derived from the four orthogonal factors achieve high internal consistency. To evaluate the importance of sustainability factors for the market success of S-REFs, between-scale comparisons were performed. Building materials and energy outweighs all other sustainability factors. It is followed by expenses,

return, and flexibility. Green space design receives the lowest importance ratings for prospective market success. Sustainability criteria of expenses, return and flexibility are expected to be more important for the market success of S-REFs than those of ecological factors. Like other sustainability scales, sustainable social infrastructure is consistent, but shows a larger importance spread of items than other scales.

The intercorrelations of sustainability criteria for REFs indicate that the importance of eco-friendly raw building materials for the market success of S-REFs is positively related to those attributed to low pollutant loading of building materials, indoor air quality, a high proportion of recyclable building materials, and renewable energy. The views of responding key financial stakeholders on the importance of high indoor air quality for the market success of S-REFs are positively related to the importance of quality of landscape and few natural hazards. The importance attributed to indoor air quality is positively related to daylight penetration in the building, well-being and feeling secure. The views of key financial stakeholders on the importance of well-being, feeling secure and social mixture of dwellers for the market success of S-REFs is likewise related. Also, low costs for construction and conservation, low expenses for value conservation, low-maintenance constructions and easy substitutability of technical components for the market success of S-REFs are positively related. As for ecological factors, their views on the importance of quality of landscape and few natural hazards are positively related to indoor air quality, low costs of conservation, and the conservation and creation of pristine areas. Likewise, the views on support for endemic plants on green areas and little sealing of soils are related to each other. With regard to sustainable social infrastructure, the importance attributed to daylight penetration in the building is positively related to indoor air quality, low costs for construction and conservation, greening of roofs and facades, quality of landscape, and few natural hazards.

3.4.2 Fund strategy and target group of S-REFs

Most responding key financial stakeholders do not agree that REFs are more risky than other investment strategies. Stability in achieving benchmark return is more important to them than absolute return of REFs. Responding investors and REF suppliers are still undecided on whether there is substantial demand for S-REFs in Switzerland, and are rather pessimistic about whether the current stock of sustainable real estate in Switzerland is sufficient to issue S-REFs.

Sustainability criteria:	Explained variance	Cron-bach's	Mean	Standard deviation
Building materials and energy:	**26.7%**	**0.79**	**5.43**	**0.78**
Low pollutant loading of building materials			<5.93*	1.23
Low-energy demand for warm water			<5.78*	0.93
High proportion of renewable energy			<5.63*	1.09
Low electricity demand during operation			5.34	1.10
Indoor air quality			5.18	1.16
Eco-friendly raw building materials			5.16	1.30
High proportion of recyclable building materials			5.03	1.23
Expenses, return, and flexibility:	**24.1%**	**0.80**	**5.14**	**0.75**
Long life cycle of structural components			<5.75*	0.94
Low costs for construction and conservation			<5.69*	1.20
Low-maintenance constructions			<5.50*	0.95
Low expenses for value conservation			5.32	1.26
Easy substitutability of technical components			5.09	1.05
Slim building technique			>4.78*	1.28
Above-average return on tenancy			>4.63*	1.26
Little demand for realty areas			>4.32*	1.35
Green space design:	**16.9%**	**0.75**	**4.14**	**1.09**
Little sealing of soils			>4.69*	1.21
Support for endemic plants on green areas			>3.91*	1.34
Greening of roofs and facades			>3.82*	1.46
Landscape and natural ecology:	**15.4%**	**0.81**	**4.96**	**1.11**
Quality of landscape and few natural hazards			5.06	1.34
Conservation and creation of pristine areas			4.85	1.07
Sustainable social infrastructure:	**–**	**0.73**	**5.18**	**0.68**
Convenient transportation network			<6.19*	0.76
Considering future development			<5.94*	0.98
Daylight penetration in the building			<5.50*	1.19
Well-being and feeling secure			<5.43*	1.37
Obstruction-free and equipped construction for the disabled			5.13	1.16
Flexibility and modifiability of building and supporting structures			>4.71*	1.16
Share of playgrounds, sports facilities, and seating accommodation			>4.50*	1.15
Social mixture of dwellers			>4.01*	1.49

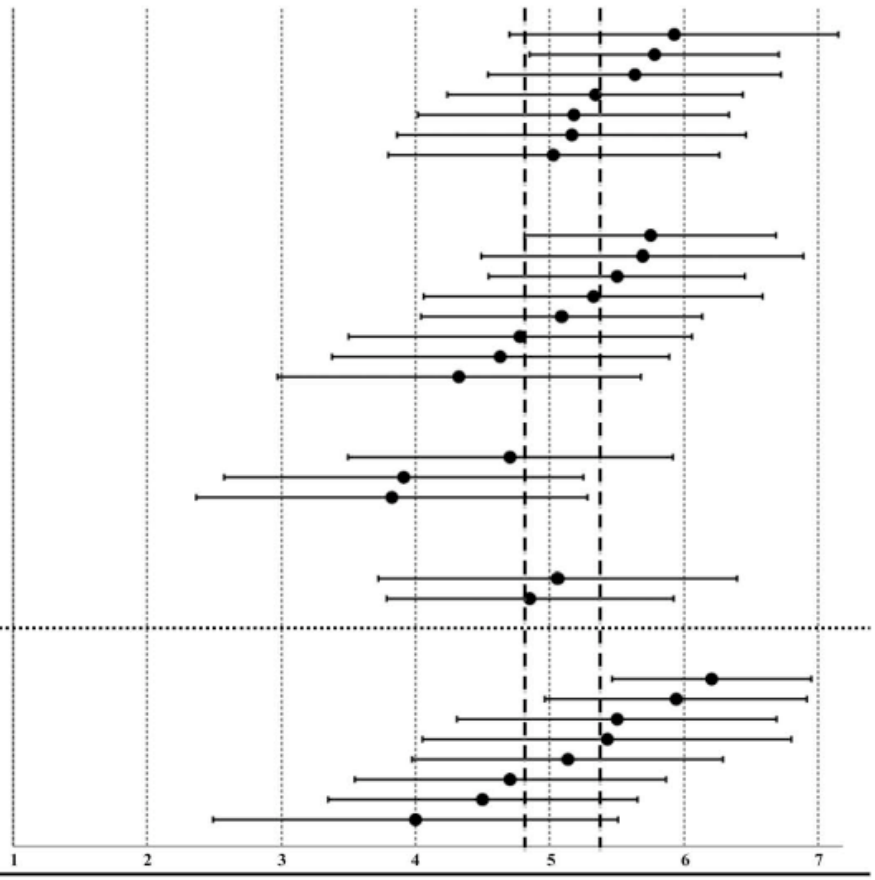


Figure 3.2 Overview on the anticipated importance of sustainability criteria for the market success of sustainable real estate funds

Notes: n = 68 key financial stakeholders. Sustainability criteria were assessed on a rating scale from 1 (unimportant) to 7 (very important). A Bonferroni-adjusted confidence interval was used to test the importance of sustainability criteria against their total mean (mean = 5.10, standard deviation = 0.56), with lower boundary confidence interval = 4.82, and upper boundary confidence interval = 5.38 (*$p \leq 0.05$). Confidence intervals are indicated by dashed lines.

The responding key financial stakeholders weighed social sustainability criteria lower (22%) for the design of S-REFs than economic (46%) and ecological (32%) ones. In their views, an S-REF should predominantly contain new buildings, followed by stock buildings and replacement buildings (cf. Table 3.3). It should predominantly contain residential buildings, but also a minor share of business buildings. No difference was found between institutional investors and REF suppliers for the proposed weighting of sustainability criteria and direct real estate investment categories for S-REFs.

Pension funds and private investors are perceived as primary target groups of S-REFs. Pension funds are considered a more propitious target group than public authorities ($t = 2.86$, $p = 0.005$). Enterprises are judged to be the least suitable target group compared with pension funds, private investors and public authorities (ts = –8.94, –6.64, and –5.30, all $p \leq 0.001$). REFs, real estate investment foundations, and direct real estate investments are viewed as the most appropriate investment products for fostering sustainable real estate. Real estate stock corporations are viewed as inferior to these others (ts = –6.46, –5.19, and –4.10, all $p \leq 0.001$).

Table 3.3 Proposed weights of sustainability criteria and direct real estate investment categories for designing a sustainable real estate fund

Weights of sustainability criteria		Weights of new, replacement, and stock buildings		Weights of residential and business buildings	
	Mean (SD)		Mean (SD)		Mean (SD)
Economic sustainability criteria	46% (0.13)	New buildings	42% (0.19)	Residential buildings	70% (0.17)
Ecological sustainability criteria	32% (0.09)	Replacement buildings	24% (0.12)	Business buildings	30% (0.18)
Social sustainability criteria	22% (0.08)	Stock buildings	33% (0.17)		

Notes: n = 68 key financial stakeholders. Column total = 100%. Further direct real estate investment categories of non-residential type are omitted in the right-hand column. Exploratory interviews with key financial stakeholders consistently suggested doing so, at least in the stages of market introduction and product settlement of sustainable real estate funds. SD, standard deviation.

3.4.3 Market acceptance by key financial stakeholders

3.4.3.1 Behavioural finance aspects of investors' market acceptance of S-REFs

About 76% of the responding investors were potential S-REF investors, i.e., they stated a preference for S-REFs by reporting their decision to invest, with an average investment volume of US$7.04 million. On the level of institutions, an average S-REF investment volume of about US$5.59 million was reported. A mean investment volume in S-REFs of US$7.98 million was reported by investors from collective foundations, US$5.55 million from pension funds, and US$4.28 million from other types of companies. Along with results for institutional investors in general, investors from 76% of the sampled pension funds stated a preference for an investment in S-REFs (n = 26 out of 34 pension funds), reporting a mean potential investment volume of US$7.28 million.

About 38% of the responding investors were willing to accept return shortfalls when investing in S-REFs. These respondents reportedly accepted an average absolute rate return shortfall of about 0.85% under benchmark. This equals a relative interest rate decrease of 21% compared with the mean REF benchmark of 2004 and 2005 (4.0%). On average, investors stated a willingness to accept return shortfalls of about 0.32% in absolute terms, equal to an accepted relative interest rate of about minus 8%.

3.4.3.2 Cognitive drivers for institutional investors' market acceptance of S-REFs

The more pronounced the anticipated local and regional sustainability management effect of S-REFs, the higher is responding investors' market acceptance of S-REFs (cf. Table 3.4). Furthermore, investors' risk tolerance is related to the amount of investment volume in S-REFs, but is negatively related to acceptance of return shortfalls, and does not affect their decision to invest in S-REFs. Environmental apathy is negatively related to their market acceptance of S-REFs. The higher their environmental anthropocentrism of responding investors, the less they decide to invest in S-REFs, but they do not differ with respect to the investment volume or their acceptance of return shortfalls. Environmental ecocentrism is not related to their market acceptance of S-REFs. The willingness of responding investors to invest in S-REFs shows no correlation with the amount of accepted return shortfalls (b = 2.69, SE(b) = 1.65, p = 0.103). Responding investors who regard building materials and

energy or expenses, return, and flexibility as more important for the market success of S-REFs are less willing to accept return shortfalls, whereas the importance of green space design is positively related to the acceptance of return shortfalls. Investors' evaluation of sustainability factors for the market success of S-REFs is not related to their willingness to invest in S-REFs. Evaluations of the importance of landscape and natural ecology as well as sustainable social infrastructure for the prospective market success of S-REFs are not related to responding investors' market acceptance of S-REFs.

Table 3.4 Summary of regression analyses for the market acceptance of sustainable real estate funds by institutional real estate investors

Dependent variable:	**Decision to invest (yes/no)**				**Investment volume (US$, millions)**				**Acceptance of return shortfalls (yes/no)**			
	b	**SE(*b*)**	***z***	***p* > |*z*|**	***b***	**SE(*b*)**	***Z***	***p* > |*z*|**	***b***	**SE(*b*)**	***z***	***p* > |*z*|**
Cognitive drivers												
Sustainability management effect	3.04	1.22	2.49	0.013	3.35	1.58	2.12	0.034	4.50	1.69	2.66	0.008
Risk tolerance	-	-	-	-	2.36	1.21	1.95	0.052	-2.86	1.42	-2.01	0.045
Environmental apathy	-2.81	1.09	-2.58	0.010	-2.31	1.18	-1.95	0.052	-2.70	1.33	-2.02	0.043
Environmental anthropocentrism	-2.20	1.24	-1.78	0.075	-	-	-	-	-	-	-	-
Importance of building materials and energy	-	-	-	-	-	-	-	-	-3.05	1.38	-2.21	0.027
Importance of expenses, return, and flexibility	-	-	-	-	-	-	-	-	-2.68	1.11	-2.42	0.016
Importance of green space design	-	-	-	-	-	-	-	-	1.52	0.91	1.68	0.094
Institutional context												
Assets under management (US$, billions)	-1.21	0.45	-2.68	0.007	-0.73	0.64	-1.15	0.252	1.86	0.73	2.55	0.011
Real estate fund (REF) investments (US$, millions)	0.02	0.01	1.91	0.057	0.03	0.01	1.86	0.063	-0.07	0.03	-2.27	0.023
Pension fund (yes/no)	4.76	2.02	2.35	0.019	-	-	-	-	-	-	-	-
Hierarchical level	-	-	-	-	-	-	-	-	0.23	0.10	2.36	0.018
Socio-demographic controls												
Age	-0.24	0.10	-2.34	0.019	-	-	-	-	-	-	-	-
Married (yes/no)	3.86	1.65	2.34	0.019	-	-	-	-	-	-	-	-
Children (yes/no)	-	-	-	-	-	-	-	-	3.47	1.41	2.47	0.014
Constant b_0	8.19	3.70	2.21	0.027	5.11	1.05	4.86	0.000	-6.64	2.25	-2.95	0.003

Notes: $n_1 = 58$ institutional real estate investors. Logistic regression (Model 1): Pseudo-$R^2 = 0.50$. Multiple ordinary least squares regression (Model 2): $R^2 = 0.24$. Logistic regression (Model 3): Pseudo-$R^2 = 0.56$. Insignificant full model independent variables (cf. the Methods section), except minimum controls (assets under management, REF investments), were omitted in the parsimonious models presented here, as indicated by hyphens. Environmental ecocentrism, the importance of landscape and the natural ecology, the importance of sustainable social infrastructure and income were insignificant in all full models predicting market acceptance of sustainable real estate funds and thus do not appear.

Investors' acceptable limit of return shortfalls of S-REFs ranges from zero to two percent under benchmark. This limit of return shortfalls is positively related to their anticipation of a sustainability management effect of S-REFs ($r = 0.33$, $p = 0.012$) and the anticipated importance of expenses, return, and flexibility for the market success of S-REFs ($r = 0.32$, $p = 0.016$). No other cognitive variable investigated is related to investors' acceptable limit of return shortfalls, and the limit of accepted return shortfalls is not related to their willingness to invest in S-REFs.

3.4.3.3 Institutional predictors for institutional investors' market acceptance of S-REFs

The total value of assets managed by the employing institution is positively related to responding investors' acceptance of return shortfalls in S-REFs but negatively related to their willingness to invest. For REF investments, contrasting results were revealed. The amount of REF investments held by the employing institution has a positive impact on investors' willingness to invest but a negative impact on the acceptance of return shortfalls. For type of company, it was found that investors from pension funds are more likely to choose an investment in S-REFs than those from non-pension fund companies. Type of company does not affect responding investors' investment volume in S-REFs or their acceptance of return shortfalls. Investors at a higher hierarchical level were found to be more likely to accept return shortfalls than those at lower hierarchical levels. Hierarchical level was not related to investors' willingness to invest in S-REFs.

3.4.3.4 Socio-demographic controls for institutional investors' market acceptance of S-REFs

Young age and marriage have a positive effect on responding to institutional investors' decisions to invest in S-REFs. Investors with children are more likely to accept return shortfalls, but no impact of parenting on willingness to invest was detected, and income was not related tomarket acceptance of S-REFs.

3.4.3.5 Behavioural finance aspects of funds suppliers' market acceptance of S-REFs

The evaluations of sustainability criteria of responding REF suppliers were compared with those of institutional investors, and no substantial spread of preferences between stakeholder

groups was found. About 30% of responding REF suppliers reported that investors are willing to accept return shortfalls when investing in S-REFs. On average, those suppliers reported that investors are willing to accept an absolute return shortfall rate of about 0.2% (SD = 0.35%) under the benchmark for S-REFs. Such estimates fit well with the preferences of responding institutional investors, who report an acceptance of return shortfalls of about 0.32% on average. About 60% of the responding REF suppliers reported that they are willing to develop an S-REF if the supply of sustainable real estate in Switzerland matches both quantity and quality.

3.5 Discussion

3.5.1 Accepted sustainability criteria for REFs

From a financial perspective, generating sustainability criteria for REFs extends the idea of sustainability criteria for investment funds (Koellner *et al*., 2005) and credit risk management (Weber *et al*., 2008). The idea integrates sustainability of buildings (Buss *et al*., 1996; SIA, 2005; Minergie, 2007, 2008), sustainable land use (Koellner and Scholz, 2007) and building environmental assessment methods (Cole, 1999, 2005). Sustainability also includes social criteria, which have been a focus of this study. Based on sustainability components that were considered important for the market success of S-REFs by expert focus groups, a questionnaire was developed to include a range of sustainability criteria for REFs. These sustainability criteria were checked for their relevance for the market success of S-REFs by another sample of key financial stakeholders. A factor analysis revealed four orthogonal sustainability factors for REFs: building materials and energy; expenses, return, and flexibility; green space design; as well as landscape and natural ecology. These orthogonal sustainability factors showed high explanatory power for the sustainability criteria used. The criteria from sustainable social infrastructure did not provide an orthogonal structure of loadings. The internal consistency of sustainability scales was high, suggesting that the sustainability scales are reliable for reflecting the sustainability views of key financial stakeholders on REFs. Based on these results, it would be favourable if those sustainability criteria that are accepted by key financial stakeholders are integrated into the development and marketing of open-ended S-REFs (cf. Kippes and Rebitzer, 2004).

3.5.2 The role of sustainable social infrastructure for REFs

The analysis of the social sustainability hypothesis (H_1) provided some ambiguous results. For responding key financial stakeholders, the mean score of the sustainable social infrastructure criteria is about as important for the prospective market success of S-REFs as expenses, return, flexibility, and as landscape and natural ecology. In their view, sustainable social infrastructure is more important for the market success of S-REFs than green space design. However, the average ratings of sustainable social infrastructure criteria for the prospective market success of S-REFs are lower than of building materials and energy, and there is a high spread among social criteria. This suggests that for responding key financial stakeholders social sustainability criteria are not dominating the market success of S-REFs. Moreover, factor analysis revealed that sustainable social infrastructure is not an independent factor, but is correlated with the orthogonal sustainability factors. This suggests that investors and REF suppliers prefer to integrate aspects of social sustainability into economic and ecological market arguments. Some criteria of sustainable social infrastructure received less weight than economic sustainability criteria of the building materials and energy, and expenses, return, and flexibility. Accordingly, some critical aspects of sustainable social infrastructure are of minor importance for responding key financial stakeholders. Weights were directly allocated by the participants. This method is suspected of under-estimating the difference of factual importance (Mettier and Scholz, 2008). Thus, differences in weight between economic and socio-ecological sustainability criteria are possibly even larger than detected.

The findings suggest evidence of a fundamental dilemma in sustainable real estate investment. Key financial stakeholders aspire to a high return on investment by avoiding social public use investments, although they may create added value for S-REFs. For example, responding key financial stakeholders attribute lower importance to genuine social criteria like infrastructure for children, families, elderly people and a social mixture of dwellers. Moreover, the sustainability components considered by focus group participants to be important for the market success of S-REFs largely neglect critical social aspects such as socio-demographic change, dweller focused construction, living space per person, mixed usages and space utilization concepts of ground floors and free spaces, or spatial connectedness. In comparison with the results presented here, Kriese and Scholz (2011) found in housing advertisements in Basel since 1870 that explicit social or participatory commitment, plus provision for the needs of children, the elderly or disabled as intended

inhabitants demonstrate social sustainability in housing for people. Accordingly, expertise from social sustainability stakeholders is needed for the construction of S-REFs that expand the set of sustainability criteria mentioned by key financial stakeholders.

3.5.3 Market acceptance of S-REFs

Within many countries, the drivers for specification and design of commercial and residential real estate are very different. Results from this study suggest an S-REF focusing on new residential buildings in distinguished locations of domestic or mixed-use districts. It seems clear that this type of investment only provides a limited contribution to social sustainability. Thus, it might be effective for district gentrification to develop mixed S-REFs, allocating assets in a diversity of building types in different life cycle stages of new and stock buildings (cf. Chun *et al*., 2004; Eichholtz *et al*., 2001; Itard and Klunder, 2007). Moreover, a sustainable real estate fund could provide added value for valuable social living on site.

With regard to anticipated importance for market success of S-REFs, results suggest that the cost and return structure of sustainability criteria are of predominant concern for key financial stakeholders. Several criteria related to decreasing life cycle costs were more important than those related to enhancing return on S-REFs, suggesting that some loss aversion is present (cf. Tversky, 1994).

Beyond the predominance of return-driven motivators, the results indicate that several non-financial cognitive drivers guide the preferences of key financial stakeholders on S-REFs. This is in line with findings that the rationales for stock investments are both economic and ethical in nature (Keller and Siegrist, 2006a), and that investments with a sustainability programme are more appealing to green/ethical and long-term investors as well as pension funds (International Institute for Environment and Development (IIED) and World Business Council for Sustainable Development (WBCSD), 2002). On the level of institutions, the sample consisted of 34 pension fund companies holding about 20% of the Swiss employee benefit assets and reporting an average investment volume of US$5.55 million in S-REFs. If those S-REF investment intentions as sampled hold true for the pension fund segment in Switzerland, a market potential of about US$950 million can be projected in this segment at this time. This is equivalent to the issuing of several promising S-REFs.

The views of responding REF suppliers and investors are similar, suggesting that professional adaptation has led to agreement on the requirements of S-REFs. The house price boom triggering the 2008 US subprime crisis seems to support such professional agreement in the finance sector (cf. Kim and Renaud, 2009). In order to be preferred investments, S-REFs with high-quality sustainable buildings located at top-level locations will become a key issue. In what way and under what constraints this option of investment includes social issues of sustainability should become an object of research. In this context, it is important that public pension funds in Switzerland are obliged to abide by legally binding investment regulations (e.g., BVG, BVV2, Public law, compliance regulations; cf. The Federal Authorities of the Swiss Confederation, 2008). Adjusting such regulations so that they do not prioritize investments achieving maximum return, but also include environmental and social criteria, is likely to influence the market success of S-REFs.

3.5.3.1 Cognitive drivers of investors' market acceptance

Legislation and regulation, market-led drivers, risks and uncertainties linked to new investment products are critical cognitive and financial drivers for products entering the market (CS, 2006; Sayce *et al*., 2007). Additional cognitive correlates of institutional investors' market acceptance of S-REFs have been identified.

The results support the sustainability management effect hypothesis (H_2). This substantiates the importance of sustainability strategies for socio-economic portfolio management (Portnov and Pearlmutter, 1999; Walker, 2003). Key financial stakeholders influence built environments, social mixture, gentrification and residents' modes of living by defining supply characteristics (Blasius *et al*., 2007; Knox and Pinch, 2000). In turn, sustainable management includes benefits for dwellers, the environment, and communities, which in turn can ease sustainable lifestyles of users.

Risk-tolerant investors appeared ready to commit higher investment volumes to S-REFs but were less willing to accept return shortfalls, whereas no effect on the decision to invest was detected (H_3). These results partly support the risk-return trade-off hypothesis (Hariharan *et al*., 2000). The results suggest that risk-tolerant investors are more open to attempt higher investment volumes in new finance products such as S-REFs than risk-averse ones, but tend

to invest less resilient in the presence of return shortfalls. The decision to invest in S-REFs seems to be rather dominated by social norms, making risk tolerance an ineffective cognitive driver. These results suggest that the presence of return shortfalls may lead to more negative cognitive responses and less acceptance among risk-tolerant than among risk-averse investors (Okuyama and Francis, 2006). Leys *et al*. (2009) argued that professionals are more apt at distancing themselves from behavioural biases when they are disciplined by the impersonal rules of their institution. These results indicate that individual cognitive drivers are active in investment decisions, which are framed by socio-demographic conditions and an institutional context.

With regard to environmentalism (H_4), it was found that environmental apathy of investors has a strong and anthropocentrism a moderate negative impact on market acceptance of S-REFs, whereas ecocentrism is not predictive. The anthropocentrism of investors decreases the probability of deciding in favour of S-REF investments. This might indicate a cognitive overweight of human over ecological goals among anthropocentric key financial stakeholders. These results support evidence found by Purser *et al*. (1995) who found that anthropocentrism is rather linked to an ecologically disembodied form of technical knowledge conjoined with egocentric orientation. If environmental apathy is present, it can serve as a cognitive barrier to realizing the benefits of S-REFs. The poor predictive power of ecocentrism for the market acceptance of S-REFs may reflect a weakness of ecocentric attitudes to motivate financial decisions. Related to this, the dominance of money attitudes in stock investments was shown by Keller and Siegrist (2006b), which may also be extended to S-REFs. Although no effect was detected of ecocentrism as a motivator for market acceptance of S-REFs, effects of demotivators like environmental apathy or anthropocentrism were found.

The results suggest that the anticipated importance of sustainable social infrastructure as well as landscape and natural ecology for the market success is not related to investors' market acceptance of S-REFs. In line with the UNEP Finance Initiative (2006), it seems that key financial stakeholders are becoming increasingly interested in sustainable real estate investments. Investors' low average of investment volumes in S-REFs supports the low-cost hypothesis (Diekmann and Preisendörfer, 1992, p. 228), which implies that individuals act in an environmentally friendly way if behavioural costs are relatively low. Small investment volumes in S-REFs can benefit impression management as a symbol of sustainable engagement (Schlenker and Weigold, 1992), while costs and risks remain relatively low.

3.5.3.2 Institutional context of investors' market acceptance

The institutional context in which investors are employed influences their market acceptance of S-REFs (H_5). In line with this, studies showed that human rights and environment are among the major concerns of pension funds (IIED and WBCSD, 2002, p. 10). Preferences of investors for S-REFs were found to depend on their hierarchical level, the assets under management, share of REFs in the investment portfolio and type of company of their employing institution. Portfolio diversification can create a potential win–win situation for investors when they enhance sustainability management and real estate investments by means of S-REFs. Lützkendorf and Lorenz (2007) found that the integration of sustainability issues into real estate asset processes is a precondition for communicating the benefits of sustainable buildings. Moreover, the results suggest that pension funds are one of the primary target groups for S-REFs in Switzerland. An estimated share of about half of their real estate investments is already allocated to indirect investments (CS, 2006, pp. 58–59, reporting a study by Lusenti Partners). Pension funds have increased their real estate investment rates, and already hold a considerable amount of REF investments (Wüest & Partner, 2006). Collective foundations, private investors and the public hand are further target groups of S-REFs. Subrahmanyam (2007) found that real estate markets are viewed as substitutes for the stock market and the findings suggest that S-REFs can take a special role.

3.5.3.3 Socio-demographic controls of investors' market acceptance

Both individual and context factors influence investment intentions in S-REFs. The socio-demography of investors influences their decision to invest in S-REFs and their acceptance of return shortfalls, but not investment volume. Age is negatively related with investors' decisions to invest in S-REFs. This could be due to higher conservatism in portfolio choice or scepticism about new finance instruments (Balvers and Mitchell, 1997). Other studies suggests that ageing is accompanied by increasing socio-political and socio-cultural conservatism (cf. Cornelis *et al.*, 2009; Danigelis *et al.*, 2007; Truett, 1993; Zakrisson and Ekehammar, 1998). These studies suggest that the relationship of age and conservatism is partly mediated through education, cohort, openness to experience, motivated cognition, and need for closure. Moreover, it was found that marriage is positively related to the decision to invest in S-REFs, and parenting to the acceptance of return shortfalls. This evidence suggests that intra- and intergenerational concerns induce higher market acceptance of S-REFs. Unlike the effect of

national income on investment in sustainable construction (cf. Lopes *et al*., 2002), the current study found that income of individual investors did not affect their market acceptance of S-REFs.

3.5.4 Differences from an international perspective

The attractiveness of S-REFs are framed by the perspective of key financial market stakeholders and their country. The real estate investment rates of German–Swiss institutional investors are higher than for U.S. institutional investment portfolios (2–3%). Some authors recommend about 6–12% REF investments in order to eliminate non-market risk (Chun *et al*., 2004). However, real estate crises in Japan, France, the UK, and Norway suggest that real estate portfolios show pro-business cycles and do not necessarily stabilize portfolios (Simond, 2004). A challenge of such uncertain market situations will be to cultivate trust (Langevoort, 1996). For this reason, stable S-REFs that are accepted on the market are an alternative for responsible portfolio diversification.

It is argued that responsible real estate investment has to include the case of S-REFs. In line with results presented by Pivo (2008) on responsible real estate investment with international professionals, auto dependency, energy, urban revitalization, environmental protection, social community development, health and safety are also important issues for S-REFs. Social corporate responsibility such as local siting, social equity and community development can be incorporated in REFs through full or contract management (McWilliams and Siegel, 2001; PRI Secretariat *et al*., 2007). As indicated by some low weights of ecological and social sustainability criteria for the market success of S-REFs, the results reported here provide evidence for the common expectation that key financial stakeholders tend to be more tied to financial than to socio-ecological aspects of REFs (cf. Union Investment Real Estate AG, 2008).

Considering sustainability criteria from a national perspective, results indicate that some aspects of sustainable development are not of high salience for key financial stakeholders. Such aspects include the redevelopment of brownfields (Genske, 2007), constructions workers' security (Mastrangelo *et al*., 2008), job satisfaction (Dabke *et al*., 2008), affordable housing considerations (McGovern, 2006), regional risk assessment from natural hazards (Bernknopf *et al*., 2001), pariah tenants (Pivo, 2008), or economic

segregation (Yang and Jargowsky, 2006). Such impacts are sometimes attributed to the responsibility of public authorities or play a marginal role in the everyday work of financial stakeholders in the real estate business.

3.5.5 Limitations of the study

Sustainability awareness is a moving field where the legal and political context of sustainability issues changes quickly. The study was done in the German-speaking parts of Switzerland, a small, wealthy and politically stable European country. In 1993, the Swiss Federal Council took responsibility for the design and coordination of sustainable development on the national level. In the aftermath, the issue of sustainable development has become a central component of the Swiss Federal Constitution (cf. The Federal Authorities of the Swiss Confederation, 1999). These requirements affect private, public and business life. However, such a sustainability engagement may differ between countries. What is understood by sustainability is the priorities of action or the weights assigned to environmental, social and economic criteria differ between developed and developing countries (cf. Krausmann *et al*., 2008). Thus, the role of S-REFs may strongly differ according to the situational constraints of national markets.

This study was done with a convenience sample of key financial stakeholders which was chosen due to availability of respondents. Nonetheless, the sample represents a considerable amount of large corporations and investors in the Swiss pension fund segment. Knowing the views, needs, demands and preferences of key financial stakeholders is thus relevant for the market acceptance of S-REFs. Moreover, investigating the relevance of such sustainability criteria for cash flow and value is relevant for the success of S-REFs. As key financial investors have primary interests and professional core experience in the economic domain, the study suggests that their opinions are limited for developing sustainable REFs at high standards. There is an ongoing need for sustainability learning and transdisciplinary discourse (Hansmann *et al*., 2003; Scholz *et al*., 2009). Moreover, there are various possibilities to define and assess responsible real estate investment criteria by including experts for the social sustainability, e.g. in Delphi methods (Pivo, 2008). Clearly, life cycle analyses have to be increasingly applied for assessing the environmental impacts of buildings (De Meester *et al*., 2009). Sustainability criteria must be informative and show the

consistency of S-REFs with recognized sustainability assessments, reporting standards, and performance benchmarks. Accordingly, the development of S-REFs according to multiple impacts of the building stock of REFs is a challenge that goes beyond a questionnaire study.

Finally, the study is based on stated preferences of key financial stakeholders, which is a common approach in environmental decision-making (Fischhoff, 2006; Powe *et al*., 2005). Stated preferences of persons are one of the few possibilities of assessing the market acceptance of products at an early stage in the product cycle (cf. Bateman *et al*., 2002, pp. 367–375). Though these methods provide insight into the preference structures of market acceptance, the specific contextual framing of the real world decision situation may alter or dominate these stated preferences (Sell *et al*., 2007; Van De Vyvere, 1994).

3.6 Conclusions

An investigation was conducted into what sustainability criteria institutional real estate investors and real estate fund (REF) suppliers consider important for the market success of sustainable property (real estate) funds (S-REFs) and what is their market acceptance. The results show that the focus of these key financial stakeholder groups is on economic aspects of energy and material flows, the life cycle of buildings, and maintenance costs, but less on ecological and also social criteria. Sustainable social infrastructure is integrated into economic and ecological market arguments. The views of key financial stakeholders on sustainability are dominated by value generation and risk avoidance, which outweigh ecological or social criteria of real estate investments. The results suggest a positive impact of an anticipated local and regional sustainability management effect of S-REFs and a negative impact of environmental apathy on responding investors' market acceptance. Investors' importance judgements on sustainability criteria are correlated with their acceptance of return shortfalls, but not with their willingness to invest. S-REFs have some, but rather limited, market potential at present. Young decision-making institutional investors working in institutions already investing in REFs and with fewer assets under management, being aware of a sustainability management effect and the environment, are a primary investor type for S-REF investments. These results are of interest for designing S-REFs to satisfy the expectation of key financial stakeholders, for marketing strategies, and future sustainability ratings of REFs.

3.7 Acknowledgements

The project ‘Investors Construct Lifestyles’ was funded by a grant from the Swiss National Science Foundation (SNSF) in its National Research Programme (NRP) 54 ‘Sustainable Development of the Built Environment’ (Project Number 405440-107075/1). The authors sincerely thank Julia M. Braendle, Rainer Gabriel, Thomas Koellner, Ulrich Kriese, Olaf Weber, four anonymous referees, and the Editor of the journal for their helpful suggestions and comments on earlier versions of this manuscript.

3.8 References

Ajzen, I. (1991) The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211.

Balvers, R.J. and Mitchell, D.W. (1997) Autocorrelated returns and optimal intertemporal portfolio choice. *Management Science*, 43(11), 1537–1551.

Barr, S. and Gilg, A. (2006) Sustainable lifestyles: framing environmental action in and around the home. *Geoforum*, 37(6), 906–920.

Bateman, I.J., Carson, R.T., Day, B., Hanemann, M., Hanley, N., Hett, T., Jones-Lee, M., Loomes, G., Mourato, S., Özdemiroglu, E., Pearce, D.W., Sugden, R. and Swanson, J. (2002) *Economic Valuation with Stated Preferences Techniques: A Manual*, Edward Elgar, Cheltenham.

Bell, S. and Morse, S. (2008) *Sustainability Indicators: Measuring the Immeasurable?*, 2nd edn, Routledge, London.

Bernknopf, R.L., Dinitz, L.B., Rabinovich, S.J.M. and Evans, A.M. (2001) A portfolio approach to evaluating natural hazard mitigation policies: an application to lateral-spread ground failure in coastal California. *International Geology Review*, 43(5), 424–440.

Blasius, J., Friedrichs, J. and Galster, G. (2007) Frontiers of quantifying neighbourhood effects. *Housing Studies*, 22(5), 627–636.

Blume, L. (2006) Local economic policies as determinants of the local business climate: empirical results from a cross-section analysis among East German municipalities. *Regional Studies*, 40(4), 321–333.

Building Research Establishment Ltd (BRE) (2007) *BREEAM Assessor Manuals*, BREEAM Centre, Garston.

Buss, S., Menzinger, I. and Tietje, O. (1996) Ökobilanz der Varianten, in R.W. Scholz, S. Bösch, T. Koller, H.A. Mieg and J. Stünzi (eds), *Industriepark Sulzer-Escher Wyss: Umwelt und Bauen – Wertschöpfung durch Umnutzung*, vdf, Zurich, pp. 161–181.

Canter, D. (2008) Do we need a metatheory of the built environment? *Building Research & Information*, 36(6), 663–667.

Chun, G.H., Sa-Aadu, J. and Shilling, J.D. (2004) The role of real estate in an institutional investor's portfolio revisited. *Journal of Real Estate Finance and Economics*, 29(3), 295–320.

Clayton, J., Gordon, J., Fabozzi, F., Giliberto, S.M., Liang, Y. and Hudson-Wilson, S. (2007) Real estate comes of age. *Journal of Portfolio Management*, 33 (Special Issue: 'Real Estate'), 15–26.

Cole, R.J. (1999) Building environmental assessment methods: clarifying intentions. *Building Research & Information*, 27(4–5), 230–246.

Cole, R.J. (2005) Building environmental assessment methods: redefining intentions and roles. *Building Research & Information*, 33(5), 455–467.

Cornelis, I., Van Hiel, A., Roets, A. and Kossowska, M. (2009) Age differences in conservatism: evidence on the mediating effects of personality and cognitive style. *Journal of Personality*, 77(1), 51–88.

Corter, J.E. and Chen, Y.J. (2006) Do investment risk tolerance attitudes predict portfolio risk? *Journal of Business and Psychology*, 20(3), 369–381.

Credit Suisse (CS) (2006) *Swiss Issues Real Estate: Facts and Trends 2006*, CS Economic Research, Zurich.

Credit Suisse (CS) (2007) *Swiss Issues Real Estate: Real Estate Market 2007 – Facts and Trends*, CS Economic Research, Zurich.

Dabke, S., Salem, O., Genaidy, A. and Daraiseh, N. (2008) Job satisfaction of women in construction trades. *Journal of Construction Engineering and Management*, 134(3), 205–216.

Danigelis, N.L., Hardy, M. and Cutler, S.I. (2007) Population aging, intracohort aging, and sociopolitical attitudes. *American Sociological Review*, 72(5), 812–830.

De Meester, B., Dewulf, J., Verbeke, S., Janssens, A. and Van Langenhove, H. (2009) Exergetic life-cycle assessment (ELCA) for resource consumption evaluation in the built environment. *Building and Environment*, 44(1), 11–17.

Di Pasquale, D. and Wheaton, W.C. (1996) *Urban Economics and Real Estate Markets*,

Prentice-Hall, Englewood Cliffs, NJ.

Diekmann, A. and Preisendörfer, P. (1992) Persönliches Umweltverhalten: Diskrepanzen zwischen Anspruch und Wirklichkeit. *Kölner Zeitschrift für Soziologie und Sozialpsychologie*, 44(2), 226–251.

East, R. (1993) Investment decisions and the theory of planned behaviour. *Journal of Economic Psychology*, 14(2), 337–375.

Eichholtz, P., Koedijk, K. and Schweitzer, M. (2001) Global property investment and the costs of international diversification. *Journal of International Money and Finance*, 20(3), 349–366.

Field, A. (2000) *Discovering Statistics: Using SPSS for Windows* (Introducing Statistical Methods), Sage, London.

Fischhoff, B. (2006) Cognitive issues in stated preference methods, in K.G. Mäler and J. Vincent (eds), *Handbook of Environmental Economics*, Elsevier, Amsterdam, pp. 937–968.

Florack, A. and Hartmann, J. (2007) Regulatory focus and investment decisions in small groups. *Journal of Experimental Social Psychology*, 43(4), 626–632.

Genske, D.D. (2007) *Investigation, Remediation and Protection of Land Resources*, Whittles, Dunbeath.

Guinée, J.B. (2002) *Handbook of Life Cycle Assessment: Operational Guide to the ISO Standards* (Eco-efficiency in Industry and Science Vol. 7), Kluwer, Dordrecht.

Guiso, L., Jappelli, T. and Terlizzese, D. (1996) Income risk, borrowing constraints, and portfolio choice. *American Economic Review*, 86(1), 158–172.

Hamilton, L.C. (2006) *Statistics with Stata: Updated for Version 9*, Thomson Higher Education, Belmont, CA.

Hansmann, R., Scholz, R.W., Crott, H.W. and Mieg, H.A. (2003) Higher education in environmental sciences: the effects of incorporating expert information in group discussions of a transdisciplinary case study. *Electronic Journal of Science Education*, 7(3) (available at: http://unr.edu/homepage/crowther/ejse/ejsev7n3.html) (accessed 30 March 2009).

Hariharan, G., Chapman, K.S. and Domian, D.L. (2000) Risk tolerance and asset allocation for investors nearing retirement. *Financial Services Review*, 9(2), 159–170.

Hilbe, J.M. (2007) *Negative Binomial Regression*, Cambridge University Press, Cambridge.

Hofstetter, P., Baumgartner, T. and Scholz, R.W. (2000) Modelling the valuesphere and the

ecosphere: integrating the decision makers' perspective into LCA. *International Journal of Life Cycle Assessment*, 5(3), 161–175.

Hosmer, D.W. Jr and Lemeshow, S. (2000) *Applied Logistic Regression*, 2nd edn, Wiley, New York, NY.

Hughes, R. (1998) *Environmental Impact Assessment and Stakeholder Involvement* (Environmental Planning Issues No. 11), IIED, London.

Immergluck, D. (2008) From the subprime to the exotic excessive mortgage market risk and foreclosures. *Journal of the American Planning Association*, 74(1), 59–76.

Intergovernmental Panel on Climate Change (IPCC) (2007) *Climate Change 2007 – The Physical Science Basis: Summary for Policy Makers. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, IPCC Secretariat, Geneva.

International Institute for Environment and Development (IIED) and World Business Council for Sustainable Development (WBCSD) (2002) *Meeting Report of the Finance, Mining and Sustainability Conference* (Washington, DC, US, 8–9 April, 2001), IIED/WBCSD, London/Geneva.

Itard, L. and Klunder, G. (2007) Comparing environmental impacts of renovated housing stock with new construction. *Building Research & Information*, 35(3), 252–267.

Johnson, D.H. (1980) The comparison of usage and availability measurements for evaluating resource preference. *Ecology*, 61(1), 65–71.

Kahneman, D. (2003) A psychological perspective on economics. *American Economic Review*, 93(2), 162–168.

Keller, C. and Siegrist, M. (2006a) Investing in stocks: the influence of financial risk attitude and values-related money and stock market attitude. *Journal of Economic Psychology*, 27(2), 285–303.

Keller, C. and Siegrist, M. (2006b) Money attitude typology and stock investment. *Journal of Behavioral Finance*, 7(2), 88–96.

Kibert, C.J. (2007) The next generation of sustainable construction. *Building Research & Information*, 35(6), 595–601.

Kim, K.H. and Renaud, B. (2009) The global house price boom and its unwinding: an analysis and a commentary. *Housing Studies*, 24(1), 7–24.

Kippes, S. and Rebitzer, D. (2004) Marketing strategies for open-ended property funds in Germany, in European Real Estate Society (ERES) (ed.), *11th European Real Estate*

Society conference, 2–5 June, 2004, Milan, Italy (available at: http://eres.ua.es/) (accessed 30 March 2009).

Knoepfel, I. and Specking, H. (2006) *Swiss SRI Market Survey*, Onvalues, Zurich.

Knox, P. and Pinch, S. (2000) *Urban Social Geography: An Introduction*, 4th edn, Prentice Hall, Harlow.

Koellner, T., Fenchel, M., Weber, O. and Scholz, R.W. (2005) Principles for sustainability rating of investment funds. *Business Strategy and the Environment*, 14(1), 54–70.

Koellner, T. and Scholz, R.W. (2007) Assessment of land use impacts on the natural environment. Part 1: an analytical framework for pure land occupation and land use change. *International Journal of Life Cycle Assessment*, 12(1), 16–23.

Koellner, T., Suh, S., Weber, O., Moser, C. and Scholz, R.W. (2007) Environmental impacts of conventional and sustainable investment funds compared using input–output life-cycle assessment. *Journal of Industrial Ecology*, 11(3), 41–60.

Krausmann, F., Fischer-Kowalski, M., Schandl, H. and Eisenmenger, N. (2008) The global sociometabolic transition. *Journal of Industrial Ecology*, 12(5–6), 637–656.

Kriese, U. & Scholz, R.W. (2011). The Positioning of Sustainability within Residential Property Marketing. *Urban Studies*, 48(7), 1503-1527.

Langevoort, D.C. (1996) Selling hope, selling risk: some lessons for law from behavioral economics about stockbrokers and sophisticated customers. *California Law Review*, 84(3), 627–701.

Laws, D., Scholz, R.W., Shiroyama, H., Susskind, L., Suzuki, T. and Weber, O. (2004) Expert views on sustainability and technology implementation. *International Journal of Sustainable Development and World Ecology*, 11(3), 247–261.

Leys, J., Vandekerckhove, W. and Van Liedekerke, L. (2009) A puzzle in SRI: the investor and the judge. *Journal of Business Ethics*, 84(2), 221–235.

Lopes, J., Ruddock, L. and Ribeiro, F.L. (2002) Investment in construction and economic growth in developing countries. *Building Research & Information*, 30(3), 152–159.

Lützkendorf, T. and Lorenz, D.P. (2006) Using an integrated performance approach in building assessment tools. *Building Research & Information*, 34(4), 334–356.

Lützkendorf, T. and Lorenz, D.P. (2007) Integrating sustainability into property risk assessments for market transformation. *Building Research & Information*, 35(6), 644–661.

Margulis, H.L. (2002) Suburban housing resale prices and housing market restructuring. *Journal of Urban Affairs*, 24(4), 461–477.

Mastrangelo, G., Carassai, P., Carletti, C., Cattani, F., Di Loreto, G., Dini, M., Mundo, A. *et al*. (2008) Association between causes of INPS compensated disability and occupational category (Veneto Region, 1994–2002): a surveillance method for occupational diseases? *Medicina del Lavoro*, 99(Suppl. 1), 57–66.

McGovern, S.J. (2006) Philadelphia's neighborhood transformation initiative: a case study of mayoral leadership, bold planning, and conflict. *Housing Policy Debate*, 17(3), 529–570.

McWilliams, A. and Siegel, D. (2001) Corporate social responsibility: a theory of the firm perspective. *Academy of Management Review*, 26(1), 117–127.

Mettier, T. and Scholz, R.W. (2008) Measuring preferences on environmental damages in LCIA. Part II: choice and allocation questions in panel methods. *International Journal of Life Cycle Assessment*, 13(6), 468–476.

Minergie (2007) *Certification*, Minergie Head Office, Bern.

Minergie (2008) *Minergie: Higher Quality of Life, Lower Energy Consumption*, Minergie Head Office, Bern.

Moffat, S. and Kohler, N. (2008) Conceptualizing the built environment as a socio-ecological system. *Building Research & Information*, 36(3), 248–268.

Morosini, M., Friebe, E., Schneider, C., Röhm, M. and Ballschmiter, K.H. (2001) *Umwelt- und Nachhaltigkeitsberichte: 61 Profile – Pilotstudie in 3 Bänden. Projekt: Relevanz von Umweltindikatoren*, No. 185, Vol. 3, TA-Akademie, Stuttgart.

NYSE Euronext (2007) *Triodos Lists Sustainable Real Estate Fund on NYSE Euronext*. Press Release, Euronext, Amsterdam.

Okuyama, N. and Francis, G. (2006) Disentangling cognitive bias in the assessment of investment decisions: derivation of generalized conditional risk attribution. *Journal of Behavioral Finance*, 7(2), 75–87.

Pivo, G. (2008) Responsible property investment criteria developed using the Delphi Method. *Building Research & Information*, 36(1), 20–36.

Pivo, G. and McNamara, P. (2005) Responsible property investing. *International Real Estate Review*, 8(1), 128–143.

Portnov, B.A. and Pearlmutter, D.C. (1999) Sustainable urban growth in peripheral areas. *Progress in Planning*, 52(4), 239–308.

Powe, N.A., Garrod, G.D. and McMahon, P.L. (2005) Mixing methods within stated preference environmental valuation: choice experiments and post-questionnaire qualitative analysis. *Ecological Economics*, 52(4), 513–526.

PRI Secretariat, UNEP Finance Initiative and UN Global Impact (2007) *PRI Report on Progress 2007: Implementation, Assessment and Guidance*, United Nations, New York, NY.

Purser, R.E., Park, C. and Montuori, A. (1995) Limits to anthropocentrism: toward an ecocentric organization paradigm? *Academy of Management Review*, 20(4), 1053–1089.

Rawls, J. (1999) A Theory of Justice, 2nd edn, Oxford University Press, Oxford.

Sappington, D. (1991) Incentives in principal agent relationships. *Journal of Economic Perspectives*, 3(2), 45–66.

Sassen, S. (2001) *The Global City: New York, London, Tokyo*, 2nd edn, Princeton University Press, Princeton, NJ.

Sayce, S., Ellison, L. and Parnell, P. (2007) Understanding investment drivers for UK sustainable property. *Building Research & Information*, 35(6), 629–643.

Schlenker, B.R. and Weigold, M.R. (1992) Interpersonal processes involving impression regulation and management. *Annual Review of Psychology*, 43, 133–168.

Schmid-Schönbein, O. and Flatz, A. (2005) *Nachhaltige Immobilieninvestments: Entwicklungen und Trends*, Rhomberg, St. Gall.

Scholz, R.W. and Binder, C.R. (2004) Principles of Human–Environment Systems (HES) research, in C. Pahl-Wostl, S. Schmidt, A.E. Rizzoli and A.J. Jakeman (eds), *Complexity and Integrated Resources Management Transactions of the 2nd Biennial Meeting of the International Environmental Modelling and Software Society*, Vol. 2, pp. 791–796, Zentrum für Umweltkommunikation, Osnabrück.

Scholz, R.W., Lang, D.J., Wiek, A., Walter, A.I. and Stauffacher, M. (2006) Transdisciplinary case studies as a means of sustainability learning: Historical framework and theory. *International Journal of Sustainability in Higher Education*, 7(3), 226–251.

Scholz, R.W., Spoerri, A. and Lang, D.J. (2009) Problem structuring for transitions: the case of Swiss waste management. *Futures*, 41(3), 171–181.

Schweizerischer Ingenieur- und Architektenverein (SIA) (2005) *SIA 112/1: Nachhaltiges Bauen – Hochbau*, SIA, Zurich.

Sell, J., Koellner, T., Weber, O., Proctor, W., Pedroni, L. and Scholz, R.W. (2007) Ecosystem services from tropical forestry projects: the choice of international market actors. *Forest Policy and Economics*, 9(5), 496–515.

Sen, A. (2001) *Development as Freedom*, Oxford University Press, Oxford.

Siegrist, M. (1996) Fragebogen zur Erfassung der ökozentrischen und anthropozentrischen Umwelteinstellung. *Zeitschrift für Sozialpsychologie*, 27(4), 290–294.

Simond, F. (2004) *Credit Risk Stress-testing: The Case of a Real Estate Crisis* [Diploma Thesis], ETHZ/UZH, Zurich.

Subrahmanyam, A. (2007) Liquidity, return and order-flow linkages between REITs and the stock market. *Real Estate Economics*, 35(3), 383–408.

Swiss Federal Statistical Office (SFSO) (2006) *Gebäude nach Gebäudeart und Bauperiode*, SFSO, Neuchâtel.

Swiss National Bank (SNB) (2007) *Investment Funds: Survey Until Q2 2005*, Monthly Statistical Bulletin June, SNB, Zurich, Monthly Statistical Bulletin June.

SWX Swiss Exchange (2007) *SWX Immobilienfonds Index*, SWX Swiss Exchange AG, Zurich.

The Federal Authorities of the Swiss Confederation (1999) *Federal Legislation of the Swiss Confederation*, Swiss Federal Authorities, Berne.

The Federal Authorities of the Swiss Confederation (2008) *Swiss Legislation*, Swiss Federal Authorities, Berne.

Thompson, S.C.G. and Barton, M.A. (1994) Ecocentric and anthropocentric attitudes toward the environment. *Journal of Environmental Psychology*, 14(2), 149–157.

Truett, K.R. (1993) Age differences in conservatism. *Personality and Individual Differences*, 14(3), 405–411.

Tversky, A. (1994) Contingent preferences: loss aversion and tradeoff contrast in decision making. *Japanese Psychological Research*, 36(1), 3–9.

UNEP Finance Initiative (2006) *Property Working Group*, UNEP FI, Geneva.

Union Investment Real Estate AG (2008) *Immobilieninvestments in Europa*, Union Investment Real Estate AG, Hamburg.

Van De Vyvere, Y. (1994) Stated preference decompositional modeling and residential choice. *Geoforum*, 25(2), 189–202.

Vlaev, I., Chater, N. and Stewart, N. (2007) Relativistic financial decisions: context effects on retirement saving and investment risk preferences. *Judgment and Decision Making*, 2(5), 292–311.

Voinov, A. (2008) Understanding and communicating sustainability: global versus regional perspectives. *Environment Development and Sustainability*, 10(4), 487–501.

Walker, A. (2003) Case study: the interaction between commercial objectives and conservation in a city-centre mixed-use development. *Journal of Retail and Leisure Property*, 3(1), 32–49.

Weber, C. and Perrels,A. (2000) Modelling lifestyle effects on energy demand and related

emissions. *Energy Policy*, 28(8), 549–566.

Weber, O., Fenchel, M. and Scholz, R.W. (2008) Empirical analysis of the integration of environmental risks into the credit risk management process of European banks. *Business Strategy and the Environment*, 17(3), 149–159.

Weber, O., Scholz, R.W. and Michalik, G. (2008) Incorporating sustainability criteria into credit risk management. *Business Strategy and the Environment* (available at http://dx.doi.org/10.1002/bse.636) (accessed 31 March 2009).

World Commission on Environment and Development (WCED) (1987) *Our Common Future*, Oxford University Press, Oxford.

Wüest & Partner (2006) *Immo-Monitoring 2006*, Wüest & Partner AG, Zurich.

Yang, R. and Jargowsky, P.A. (2006) Suburban development and economic segregation in the 1990s. *Journal of Urban Affairs*, 28(3), 253–273.

Zakrisson, I. and Ekehammar, B. (1998) Social attitudes and education: self-selection or socialization? *Scandinavian Journal of Psychology*, 39(2), 117–122.

Endnote

[1] Minergie is a registered brand for new and refurbished buildings in Switzerland.

4 Identifying stakeholders' views on sustainable urban transition: desirability, utility and probability assessments of scenarios

Manuscript published as Bügl, R., Stauffacher, M., Kriese, U., Lehmann Pollheimer, D., & Scholz, R.W. (accepted). Identifying stakeholders' views on sustainable urban transition: desirability, utility and probability assessments of scenarios. *European Planning Studies*.

Abstract

The assessment of different urban planning scenarios by stakeholders can yield important insights which, in turn, inform sustainable urban transition. Yet to gain in-depth insight, this assessment needs to be multi-faceted and should go beyond a unidimensional "most/least desired" approach. Accordingly, we use indicators that distinguish between desirability, utility and probability assessments. We compare these assessments within and between various stakeholder groups based on a set of literature-based hypotheses. We constructed six planning scenarios, systematically varied with respect to sustainability for the case study, "Erlenmatt", a major urban redevelopment area in Switzerland. Three stakeholder groups (housing suppliers, the non-profit & public sector and housing target groups, n = 80) were investigated. The results of the statistical analyses suggest that more sustainable scenarios are preferred with respect to both their desirability and utility and that their probability is not lower than that of the other scenarios. The non-profit & public sector is the most pessimistic about the probability of a sustainable district while housing suppliers desire it less. We conclude that such detailed subjective scenario assessments can provide informative and detailed guidance for sustainable urban transition.

4.1 Introduction

The built environment continues to grow, with the share of urbanization increasing steadily and rapidly (Ratcliffe, Stubbs and Keeping, 2009). The development of the built environment affects many societal actors, moves huge capital stocks and results in direct and indirect consequences on various temporal and spatial scales. Therefore, a need exists to improve knowledge about urban transitions, i.e., the process of planned transformations of a city or its districts and suburbs from one state to another (cf. Dawson, 2011; Kohler and Hassler, 2002). Errors in such urban transitions can hardly be reversed and have implications well beyond the concrete project area. This means that urban planning is challenged to prospectively assess the potential performance of the future building stock with the pros and cons of different planning alternatives and to cope with possible conflicts between stakeholders. The inherent conflict between the value systems of managers and those of building, construction and design professionals can make integrating interests and aspirations quite difficult (Cook, 2007). In the end, unresolved social conflict between stakeholders can cause a stalemate that blocks any urban transition.

Sustainable development is one broadly supported goal in planning for such transitions (Baccini, 1996; Choguill, 2007; Evans and Jones, 2008; Gospodini, 2005). According to a recent expert study, sustainable development is defined as system limit management, respecting future generations and organized as an ongoing inquiry process (Laws *et al*., 2004). Sustainable urban transitions answer an urgent need to reconfigure urban areas so they consume fewer resources, emit less pollution, are more resilient and more sustainable in general (Dawson, 2011). Specifically, Dawson (2011) points out potential pitfalls that may be encountered along such sustainable urban transitions. They range from the practical issues of analyzing and realizing sustainable cities to more philosophical issues such as a detailed understanding of urban sustainability. Such pitfalls may result in a set of undesirable side effects in urban development such as unsustainable urban growth, urban decline or reconfiguration of urban patterns.

Facilitating and guiding sustainable urban transitions is a challenge. Urban planners must simultaneously cope with a wide range of future states, high uncertainties and complex interdependencies not only between stakeholders, but also between design components of urban

transitions. Therefore, urban planners need scientific support to help navigate a better development track (Azerrad and Nilon, 2006). In such a situation, scenarios can offer a helpful tool with which to thoroughly scrutinize existing plans and potential alternatives. In fact, a lack of alternatives has been shown to be a major pitfall in urban development (Priemus, 2010). However, such alternatives need to be constructed in a sound manner, e.g., in the third generation of foresight research, iteratively and in consultation with different actors (Hanssen, Johnstad and Klausen, 2009). Furthermore, the construction of a broad range of possible future states should produce comparable alternatives that allow for a detailed assessment of their consequences (Scholz and Tietje, 2002). Scenarios offer a possibility of eliciting detailed assessments from stakeholders and incorporating the views of different stakeholder groups (Scholz and Tietje, 2002; Loukopoulos and Scholz, 2004; Wiek, Binder and Scholz, 2006). Also, an early assessment of planning scenarios by stakeholders can be used to anticipate their market potential so they can be positioned successfully in a market economy (Haase *et al*., 2008; McDermott, 1998; Priemus, 2007). Simple cost-benefit analyses are sometimes misleading, as costs are often underestimated and benefits overestimated; this is especially true because the monetarizing of indirect effects is problematic (Priemus, 2010). Assessments that complement cost-benefit analysis and allow the incorporation of the concerns and wishes of different stakeholders are necessary. In addition, such assessments facilitate the detection of potential social conflicts between different stakeholders.

In the field of sustainable urban transitions, questions such as the following are of interest: are more sustainable scenarios preferred over less sustainable ones? Are more preferred scenarios assessed as being more or less probable than less preferred ones? Are there differences in these assessments between different stakeholders? To answer such questions and to inform sustainable urban planning, detailed case studies investigating scenarios in real-world settings are necessary.

The case study underlying this paper illustrates the application of such a scenario assessment in the Canton of Basel, Switzerland (cf. Section 2.1). The assessment was structured in two steps: (1) a *detailed individual assessment* eliciting stakeholder assessments of urban planning scenarios, using a set of criteria and activating different modes of thought; (2) a *social conflict analysis* that identifies differences in the individual assessments of scenarios between different stakeholders.

4.1.1 Detailed individual assessment

The first challenge is to obtain detailed individual assessments from stakeholders for different planning scenarios. To inform planning, this assessment needs to go beyond a simple most/least desired approach. Multiple perspectives are needed to identify and monitor a scenario's level of performance and its functional complexity (Zandvliet, Bertolini and Dijst, 2008). Degree of desirability, utility and probability have been proposed as indicators and concepts with which to assess and compare different scenarios. For example, desirability was used to assess the character of appearance of an area, the need for eradication or planning control and how competitive cities are at business (Ratcliffe, Stubbs and Keeping 2009; UN-Habitat, 2009). Utility was used to assess and compare a client's objectives, plan performance and the rationality of decisions (Cook, 2007; Pati, Park and Augenbroe, 2009; UN-Habitat, 2009). Probability was used to assess and compare prediction models, risk and uncertainty in property investment appraisal and building performance (Pati, Park and Augenbroe, 2009; Ratcliffe, Stubbs and Keeping, 2009). All these concepts and indicators can be used to assess scenarios by themselves, but also can be combined in order to obtain a multi-faceted assessment. In a trade-off situation, for example, sustainable scenarios might be dropped due to a low probability, even though they might be desired. Sustainability is certainly a factor that makes a positive difference in urban planning (Choguill, 2007; Evans and Jones, 2008), yet until two decades ago, many actors viewed business-as-usual as more probable than sustainability (Goodland, 1992). Over the past decade, the awareness and acceptance of sustainability has spread widely among the actors involved (Meijer, Itard and Sunikka-Blank, 2009). Accordingly, we no longer expect that sustainable scenarios are perceived as less probable.
Sustainability hypothesis (H_1): Sustainable scenarios are more preferred and perceived as being as probable as less sustainable scenarios.

Care needs to be taken as to how such assessments are elicited: decisions by stakeholders in this field require a detailed analysis of criteria (analytic mode), which can lead to a different result than a spontaneous judgment (intuitive mode) in an interview. In fact, the intuitive and the analytic mode are two cognitive systems that are activated for uncertain judgment tasks (Scholz, 1987, pp. 60-64). The intuitive mode is fast, effortless and associative, while the analytic mode is slow, effortful and rule-governed. In reality both modes are at play when, for instance, an investment decision is made. Therefore, it is instructive to collect information in both modes. By using a set of different criteria, we try to induce the analytic mode. In general, the

analytic mode requires a higher cognitive effort than the intuitive mode and makes negative aspects more salient (e.g., Denes-Raj and Epstein, 1994). For this reason, we expect the intuitive assessment (desirability) of scenarios to be higher than the analytical assessment (utility).
Cognitive system hypothesis (H_2): The intuitive assessment (desirability) of a scenario is higher compared than the analytical assessment (utility).

4.1.2 Social conflict analysis

A second challenge is to anticipate social conflict between stakeholders. Social conflict is a perceived rather than true divergence of interest, and a belief of different parties that their current aspirations are incompatible (Pruitt and Kim, 2004). Different assessments between actors are a source of social conflict (Button, 2002). Here social conflict is related to differences in the assessment of alternative scenarios between different actors. While sustainable development is supported by different stakeholder groups, the public sometimes sees a trade-off between, for instance, compact city policies and quality of life (Howley, Scott and Redmond, 2009). Furthermore, many building professionals focus on market success and financial profits, and accord lower priority to sustainability, or see its use merely in creating brand images (Adams, 2004; Lo, Zhao and Cheng, 2006). The non-profit sector, on the other hand, is rather pessimistic about the probability of sustainable development (Mangahas and Guerrero, 2002), while investors seem to have a moderately optimistic view (Wang, 2001). Some suppliers, however, have little confidence in the desirability of sustainable development (Rayner, 2004). Knowing in advance about such differences between stakeholders is vital when planning sustainable urban transitions.
Dissent hypothesis (H_3): Stakeholder groups assess scenarios differently with respect to desirability, utility and probability.

In a situation of social conflict with varying stakeholder assessments for different scenarios, information about possible agreements and optimal solutions is helpful and necessary for broadly accepted urban transitions. While a zone of agreement describes a solution that all groups can agree to, a Pareto-optimal solution would have the best assessment from all stakeholder groups (Loukopoulos and Scholz, 2004; Susskind, McKearnen and Thomas-Lamar, 1999). More concretely, we are interested in finding the scenario with the best assessment, which has no substantial dissent among stakeholder groups.
Optimal solution hypothesis (H_4): There are scenarios that are highly desirable and useful for all stakeholder groups, with no substantial dissent between them.

4.2 Methods

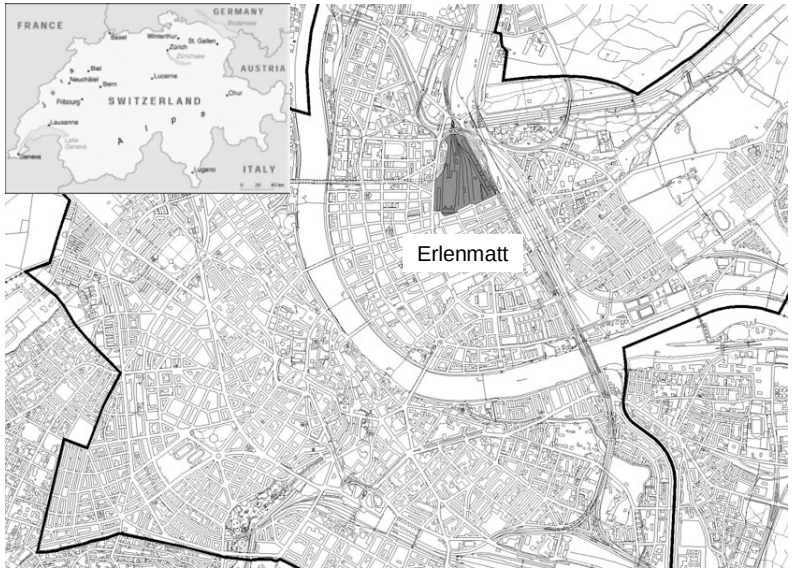
4.2.1 Description of the case study

Our research is part of a transdisciplinary case study on the conversion of a major urban redevelopment area (Erlenmatt) in the Canton of Basel-Stadt, in northwestern Switzerland (cf. Table 4.1, Figure 4.1). Erlenmatt lies on a former rail freight depot and comprises 19.2 hectares, of which 9.1 hectares are building land with 10 building plots and 212,000 m^2 gross floor area. About 8 hectares will be parkways, public spaces and a conservation area. Stepwise site development started in 2007 and will last for the next 15-20 years. A mixed-usage district with about 700 apartments for 1,800-2,000 dwellers and 1,100-2,000 working places will be the result (RR-BS, 2010). The building plan provides block structures with a layout that is focused on medium to large apartments for rental. Non-residential usages concentrate on building plot A and the streetside buildings.

Table 4.1 Site development of Erlenmatt: summary of capacity and type of usage

	Gross floor area (GFA)		
Building plot	Maximum	Housing	Non-housing
A (Alders Meadow Gallery), H, I, J	81,500 m^2	39,000 m^2	A: Extensive sale areas (>1,200 m^2) H-J: Service, trade, neighbourhood sales areas
B (Alders Gate)	36,000 m^2	30,000 m^2	Public school, neighbourhood sales areas
C	16,000 m^2	---	Private school
D	22,400 m^2	5,000 m^2	Service
E, F, G	56,100 m^2	41,000 m^2	Service, trade, neighbourhood sales areas
N	21,600 m^2	---	High-rise building, underground car park
Total GFA	212,000 m^2 (max.)	115,000 m^2 (at least)	97,000 m^2 (max.)

Note: Total GFAs for non-housing usage are for workplaces (94,000 m^2), comprising service/trade (64,000 m^2) and retail sales (30,000 m^2) – and a public primary school (3,000 m^2). A day nursery is planned. On building plot A, a shopping centre (29,000m^2), a ***+ hotel with 240 rooms (8,400 m^2), a fitness centre (2,500 m^2), and 600 underground car parking spaces will be realized (RR-BS, 2010).



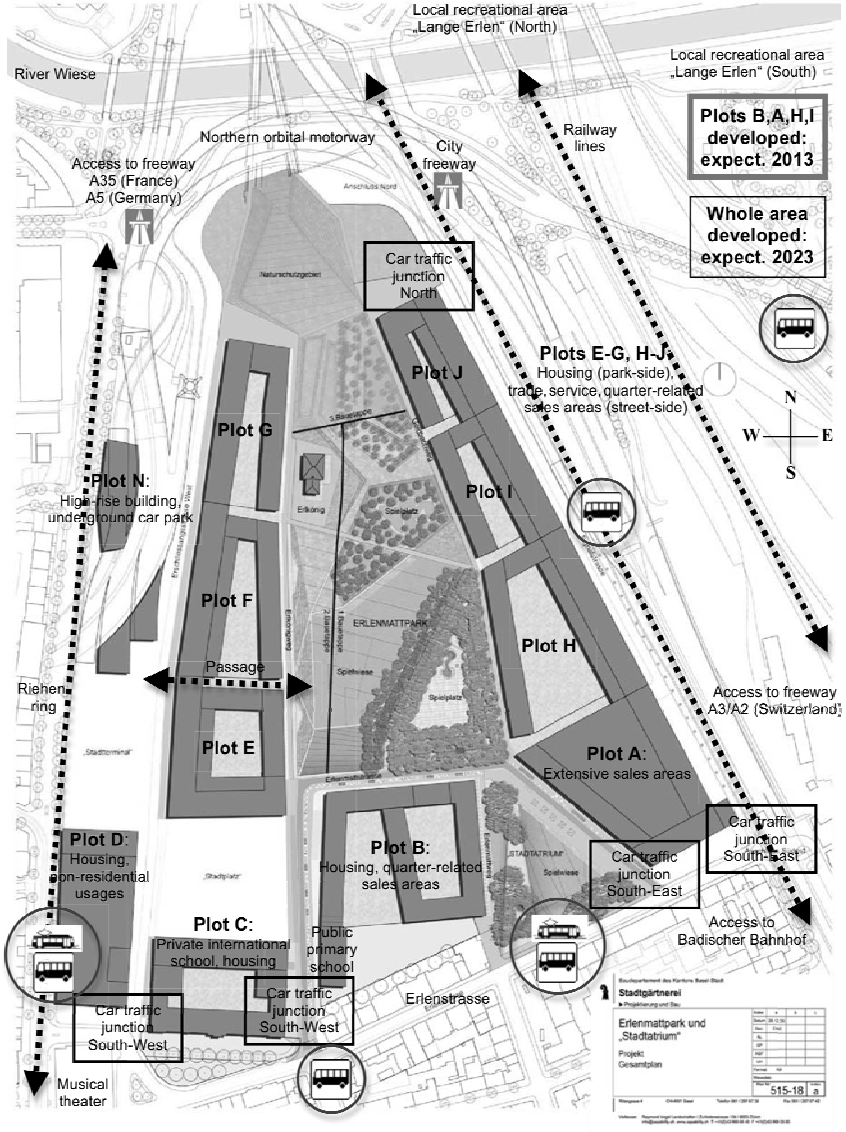


Figure 4.1 Location, building plots, green spaces and infrastructure measures

Note: The Erlenmatt area is shaded in dark grey. The inset illustrates the location of Basel in the north-western part of Switzerland. Details on the mixture and distribution of usages per plot and infrastructure development are not exclusive or drawn to scale. Source: Adapted from RR-BS (2010).

4.2.2 Sample description

Three stakeholder groups were included: housing suppliers, the non-profit & public sector and housing target groups, because they are key decision makers for supply and demand in the Swiss housing sector (Kriese and Scholz, 2011). The sample consisted of n = 80 stakeholders; housing suppliers were decision-making institutional investors, project developers or sustainability architects in the housing sector (n_1 = 24; participation rate (PR) = 39.3%). The non-profit & public sector consisted of decision-making administrators from cantonal planning or sustainability NGOs (n_2 = 27; PR = 58.7%). Housing target groups were parents of young families or life science personnel with a modern orientation (n_3 = 29; PR = 4.7%; cf. Sinus Sociovision GmbH, 2007, for social milieus). The low participation rate of housing target groups was presumably due to less interest in the topic, less relevance for professional and private life, less familiarity with the case and less freedom to participate during the day when most of the interviews took place. Within the housing target groups, both parents were 18-40 years old and families had a toddler of up to three years old. The housing target groups were at least middle-middle class as defined by gross income or professional aspiration level (SFSO, 2007, 2008abc). These housing target groups were identified by the landowner and the Canton of Basel-Stadt as key for the Erlenmatt and the urban planning goals of the Canton (Präsidialdepartement des Kantons Basel-Stadt, 2008; Vivico Real Estate GmbH, 2008).

4.2.3 Scenario construction

We constructed six urban planning scenarios that varied systematically with respect to sustainability (cf. Table 4.2, from strongly unsustainable to strongly sustainable). The construction process was informed by the Formative Scenario Analysis method (Scholz and Tietje, 2002). The actual selection was more intuitive and driven by the idea of having contrasting scenarios capable of identifying individual trade-offs and conflicts between stakeholder groups. Scenarios were constructed by a transdisciplinary case study team comprising scientists, planning administrators and the landowner. The zoning and building plan and front-side usages across the street between 2010 and 2025 were set as system boundaries. All scenarios were described comprehensively with a shared understanding of possible future development paths (Gregory, Fischhoff and McDaniels, 2005). In order to examine concrete decision-

making on sustainability, Majoor (2009) suggested structuring the action space of urban planning according to the design of different operational domains for sustainable development.

For identifying design components of sustainable urban transitions, we used the urban district development plan (RR-BS, 2004), the cantonal report on sustainable development (RR-BS, 2005), and the federal indicator system on sustainable development (SFSO, 2004). Five different design components were selected by the transdisciplinary case study team to structure all scenarios from an environmental, social and economic perspective on urban planning: social milieu (Hermelin, 2009; Sinus Sociovision GmbH, 2007), ecodesign (Jim, 2004), building (Cook, 2007), finance (Brueggeman and Fisher, 2008), and social infrastructure (Schetke and Haase, 2008). Social milieu covered the social structure and lifestyle of dwellers in the building project; ecodesign involves the green space and landscape ecology of the building project; building covers the housing and business units, energy standard, building design and mixture of usages in the building project; finance addresses the cost and value added of the building project; and social infrastructure involves the social networking and social services in the building project. To systematically vary the scenarios with respect to sustainability, we used various data from different sources (SFSO, 2004, 2007, 2008abc; SFSO and ARE, 2007; Statistisches Amt des Kantons Basel-Stadt, 2008).

The six urban planning scenarios differed in their mix of design components. The returnee district had a strongly sustainable mix of design components with a social milieu of very well-earning households with a voluntary simplifier lifestyle. The family district had a moderately strongly sustainable mix of design components with a social milieu of well-earning households with a frugal lifestyle. The social district had a moderately weakly mix of weak sustainable design components with a social milieu of low-earning households with a voluntary simplifier lifestyle. The upmarket district had a weakly sustainable mix of design components with a social milieu of well-earning households with a distinct lifestyle. The transitory district had a weakly unsustainable mix of design components with a social milieu of average-earning household with a mainstream lifestyle. The profit failure district had a strongly unsustainable mix of design components with a social milieu of low-earning households with a very wasteful lifestyle.

Table 4.2 Urban planning scenarios: summary of scenario construction

Design component	1. Unsustainable districts		2. Business-as-usual districts		3. Sustainable districts	
	1.1 Profit failure district (*Strongly unsustainable*)	**1.2 Transitory district** (*Weakly unsustainable*)	**2.1 Upmarket district** (*Weakly sustainable*)	**2.2 Social district** (*Moderately weakly sustainable*)	**3.1 Family district** (*Moderately strongly sustainable*)	**3.2 Returnee district** (*Strongly sustainable*)
Social milieu:	Social segregation district; low-earning couples, families with children and senior households (--)	Social segregation district; average-earning singles, young couples and senior households (-)	Social mix district; very well-earning families with children, immigrant- and senior households (++)	Social segregation district; low-earning couples, families with children and senior households (--)	Social mix district; well-earning families with children, single- and senior households (+)	Social mix district; very well-earning families with children, immigrant- and senior households (++)
	Very wasteful lifestyle; very passive health habits; very low social commitment (--)	Mainstream lifestyle; passive health habits; low social commitment (-)	Distinct lifestyle; average health habits; low social commitment (o)	Voluntary simplifier lifestyle; very active health habits; very high social commitment (++)	Frugal lifestyle, active health habits; very high social commitment (+)	Voluntary simplifier lifestyle; very active health habits; very high social commitment (++)
Ecodesign:	Park is deserted; inner courtyards are private; no facade greenery exists on the late plots (--)	Park is seldom used; inner courtyards are private; no facade greenery exists on the early plots (-)	Park is deserted; inner courtyards are private; no facade greenery exists on the late plots (--)	Park is very lively; inner courtyards are widely used; facade greenery exists on the late plots (++)	Park is popular; inner courtyards are semi-public; facade greenery exists on the early plots (+)	Park is very lively; inner courtyards are widely used; facade greenery exists on the late plots (++)
Building:	Many uniform 70-110 m^2 apartments; large commercial areas; inflexible barrier layout (--)	Many uniform 60-100 m^2 apartments; large commercial areas; inflexible barrier layout (-)	Many uniform 70-110 m^2 apartments; large commercial areas; inflexible barrier layout (--)	Many diverse 90-140 m^2 apartments; small commercial areas; flexible barrier-free layout (++)	Many diverse 90-150 m^2 apartments; small commercial areas; flexible barrier-free layout (+)	Many diverse 90-140 m^2 apartments; small commercial areas; flexible barrier-free layout (++)
	Standard equipment; heating demand is 20% below current standard (--)	Standard equipment; heating demand equals current standard (-)	Quality equipment; heating demand is 40% below current standard (++)	Standard equipment; heating demand is 20% below current standard (--)	Quality equipment; heating demand is 20% below current standard (+)	Quality equipment; heating demand is 40% below current standard (++)
	No stylistic guidelines; perceivable design elements of the facade (--)	Low building density; many uniform block and row house buildings (-)	Stylistic guidelines exist; facades are marked by loggias (++)	No stylistic guidelines exist; perceivable design elements of the facade (--)	High building density; many diverse building types (+)	Stylistic guidelines exist; facades are marked by loggias (++)
	Mostly noisy housing; rental property only; 270-310 US$/$m^2$ rent per year; very poor service spaces (--)	Mostly housing; rental property only; 220-270 US$/$m^2$ rent per year; unaccepted service spaces (-)	Quiet mixed usage district; 20% condominiums; 220-270 US$/$m^2$ rent per year; booming service spaces (++)	Quiet mixed usage district; 20% condominiums; 220-270 US$/$m^2$ rent per year; booming service spaces (++)	Mixed usage district; 15% condominiums; 200-220 US$/$m^2$ rent per year; well-accepted service spaces (+)	Quiet mixed usage district; 20% condominiums; 220-270 US$/$m^2$ rent per year; booming service spaces (++)
Finance:	Low building costs; high running costs; low equity-to-assets ratio; short-term marketing; expected return of 6.5-8.0% (--)	Low building costs; high running costs; low equity-to-assets ratio; mid-term marketing; expected return of 6.5-8.0% (-)	Low building costs; high running costs; low equity-to-assets ratio; short-term marketing; expected return of 6.5-8.0% (--)	High building costs; low running costs; high equity-to-assets ratio; long-term marketing; expected return of 4.0-5.5% (++)	High building costs; low running costs; high equity-to-assets ratio; long-term marketing; expected return of 4.5-6.0% (+)	High building costs; low running costs; high equity-to-assets ratio;, long-term marketing; expected return of 4.0-5.5% (++)
Social infrastructure:	Optional tram prolongation is not yet realized; no Mobility-Car-sharing; area is on urban outskirts (--)	Planned tram line south of the area is not yet realized; little investment in internal area trailways (-)	Optional tram prolongation is realized; Mobility-Car-sharing; area is well-connected (++)	Optional tram prolongation is not yet realized; no Mobility-Car-sharing; area is on urban outskirts (--)	Planned tram line southwards of the area is realized; much investment in internal area trailways (+)	Optional tram prolongation is realized; Mobility-Car-sharing; area is well-connected (++)
	No district management; no meeting point; no self-organization (--)	No care and support services; no influence on the design of public spaces (-)	No district management; no meeting point; no self-organization (--)	Active district management; meeting point; self-organization (++)	Care and support services; influence on the design of public spaces (+)	Active district management; meeting point; self-organization (++)

Note: Sustainability was used to systematically vary the different system attributes of the scenarios. --: much below average, -: below average, o: average, +: above average, ++: much above average.

4.2.4 Scenario assessment

We used an Exploration Parcours (EP), a systematic, standardized and contextualized multiple-step procedure, to assess these scenarios (Scholz and Tietje, 2002, pp. 197-224). The EP resembles the idea of Kurt Lewin's Experimental Action Research. Experimental Action Research has been widely integrated in case study principles in order to provide a detailed in-depth knowledge of cases (Cunningham, 1997; Scholz, 2011). Lewin realised that the use of controlled laboratory research or questionnaire studies, which lack the context of a real-world setting, are not enough for a valid investigation of behaviour. Having this rationale in mind, Lewin developed Experimental Action Research in order to compare how different groups of people react to controlled real-world settings. Based on the idea of Experimental Action Research, the EP is a transdisciplinary method of area development negotiation. The EP serves for an informed policy by case comprehension, mutual learning and the refinement of special cases (Scholz and Stauffacher, 2007; Stauffacher *et al*., 2008). In an EP, stakeholders individually complete a standardised assessment. It consists of several steps that require them to examine various future scenarios from different perspectives. Detailed preference information is elicited from all participants and likewise, consensus and dissent between stakeholder groups about possible future development paths can be determined. The scenario assessment was performed as an experiential case encounter in guided single-participant sessions. For mental preparation, a booklet was distributed beforehand with a case description and the storyline of each scenario. Each case was verbally introduced to the participants using a case leaflet note. Then the project milestones were explained using a 1:5000 planning model. The scenarios were randomly presented with posters, slide shows and audio. Then the participants were asked to label each scenario with a self-selected name in order to avoid priming. The scenarios were compared using the following assessment indicators: desirability, utility and probability. Desirability indicates the *intuitive* attractiveness of a scenario. Utility was assessed using a set of six sustainability criteria (cf. Table 4.3), and indicates the *analytical* attractiveness of a scenario. Probability was used to indicate how likely the realization of a scenario was perceived. Individual assessments were elicited face-to-face: desirability and probability, each with a centigrade response scale from 0 = not at all to 1 = very high, and utility, with the same scale but individually for the six sustainability criteria. Participants further weighted the importance of each criterion; the utility of each scenario was then computed with the weighted sum of all criteria ratings.

Table 4.3 Analytical assessment of utility: summary of sustainability criteria

	Local	Global/regional
Environment	***Environmental impacts on Erlenmatt*** Local environmental impacts are the impacts on flora and fauna, as well as green space and landscape ecology, which are caused by the area by the development and the usage of the Erlenmatt area.	***Global environmental impacts*** Global environmental impacts are those that are caused worldwide by planning, development, usage, reconstruction re-usage, and demolition over the whole life cycle of the Erlenmatt area.
Society	***Individual satisfaction of Erlenmatt*** Individual satisfaction covers the physical, social and material well-being, quality of life, sense of security, and identity of the inhabitants of the Erlenmatt area.	***Contribution to social structures in the Basel region*** The regional contribution of the Erlenmatt area to social structures covers the integrity, social value, and the gentrification of the social environment in the Basel region.
Economy	***Market success of Erlenmatt*** The market success of the Erlenmatt area covers the economic costs and yields over the life cycle, including the return on investment by rent, sale, and servicing, as well as the costs of vacancy risk, loss of rent, and price fluctuation.	***Economic attractiveness of the Basel region*** The economic attractiveness of the Basel region covers the preservation and creation of new working places, business and industrial enterprises, rentability, and investment streams by the Erlenmatt area.

Individual response profiles were charted on the spot and then discussed with the participants. The scenario assessment took about 100 minutes. Afterward, the participants filled out a 20-minute questionnaire on urban family living (cf. Kriese, Bügl and Scholz, accepted), their evaluation of the EP and socio-demographic data.

4.2.5 Data analyses

All statistical analyses were done using SPSS 16.0 and Stata 10.1 for Mac. The assessment indicators were used as dependent variables in the analysis. To analyse the detailed individual assessments, we applied repeated measurement analysis of variance (ANOVA); the sustainability of the different scenarios was used as the panel variable. For the social conflict analysis, we used univariate ANOVA; each scenario was fixed in a separate ANOVA and stakeholder group was used as the independent variable. To control for multiple testing, we used Bonferroni-corrrected p-values where appropriate.

4.3 Results

4.3.1 Detailed individual assessment

4.3.1.1 Sustainability hypothesis

Desirability, probability and utility increase as the level of sustainability (see 1.1 to 3.2 in Table 4.2) of urban planning scenarios rises (cf. Figure 4.2 for desirability and probability; $F_{\mathrm{d}}(5,75) = 136.49$, $F_{\mathrm{p}}(5,75) = 7.90$, $F_{\mathrm{u}}(5,75) = 77.93$, all $p < .001$). The effect of sustainability on desirability and utility is substantially higher than its effect on probability. Sustainable and business-as-usual districts are more desired and have a higher utility than unsustainable districts (all $p < .001$). Sustainable districts are not considered less probable than business-as-usual districts; for instance, the returnee and the family district are considered as probable as the social district and the upmarket district ($t_{\mathrm{p,32\text{-}22}}(79) = 0.36$, $t_{\mathrm{p,31\text{-}22}}(79) = 1.61$, $t_{\mathrm{p,32\text{-}21}}(79) = -1.34$, $t_{\mathrm{p,31\text{-}21}}(79) = -0.12$, all $p_{\mathrm{p}} > .05$). Both sustainable districts are assessed equally with respect to their desirability, probability and utility ($t_{\mathrm{d,32\text{-}31}}(79) = 0.17$; $t_{\mathrm{p,32\text{-}31}}(79) = -1.25$, $t_{\mathrm{u,32\text{-}31}}(79) = 0.86$, all $p > .05$). Within the business-as-usual districts, the social district has a higher desirability and utility ($t_{\mathrm{d,22\text{-}21}}(79) = 6.39$, $p_{\mathrm{d,22\text{-}21}} < .001$, $t_{\mathrm{u,22\text{-}21}}(79) = 5.41$, $p_{\mathrm{u,22\text{-}21}} < .001$), but the same probability as the upmarket district ($t_{\mathrm{p,22\text{-}21}}(79) = -1.68$, $p_{\mathrm{p,22\text{-}21}} > .05$).

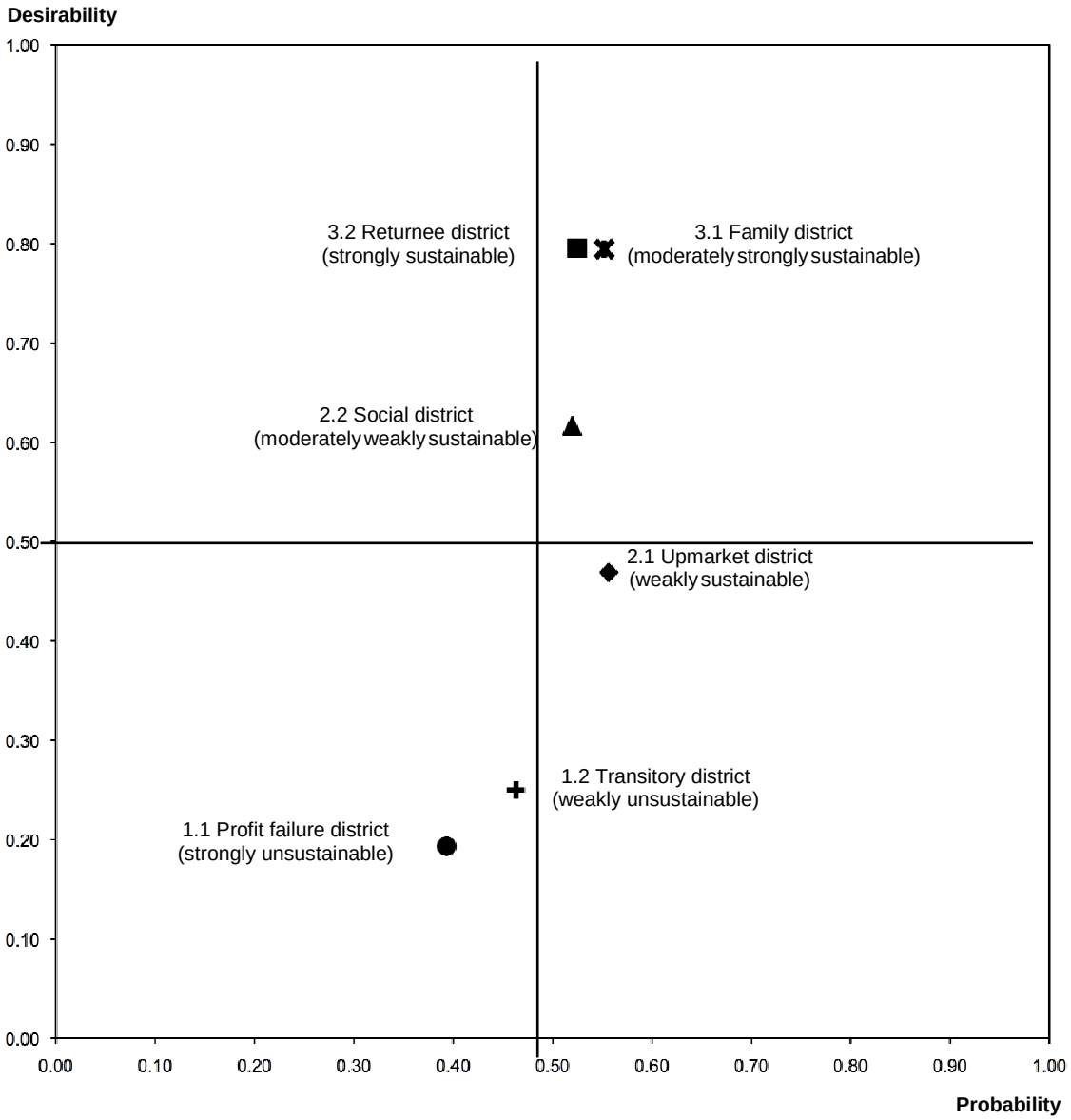


Figure 4.2 Detailed individual assessment: mean values of desirability vs. probability assessments (all stakeholders)

Note: n = 80 (476 observations).

4.3.1.2 Cognitive system hypothesis

With the exception of highly undesirable districts, the intuitive attractiveness (desirability) of urban planning scenarios generally exceeds their analytical attractiveness (utility; cf. Figure 4.3; $F(5,75) = 38.72,\ p < .001$). Still, the analytical attractiveness is higher for more sustainable scenarios than less sustainable scenarios. On average, the desirability of urban planning scenarios is 17 percentage points higher than their utility ($SD = 0.26$). The relationship between desirability and utility is inversely u-shaped. The maximum difference between desirability and utility is located at medium utility ($u = 0.44, d = 0.64$), diminishing with very low or very high utility.

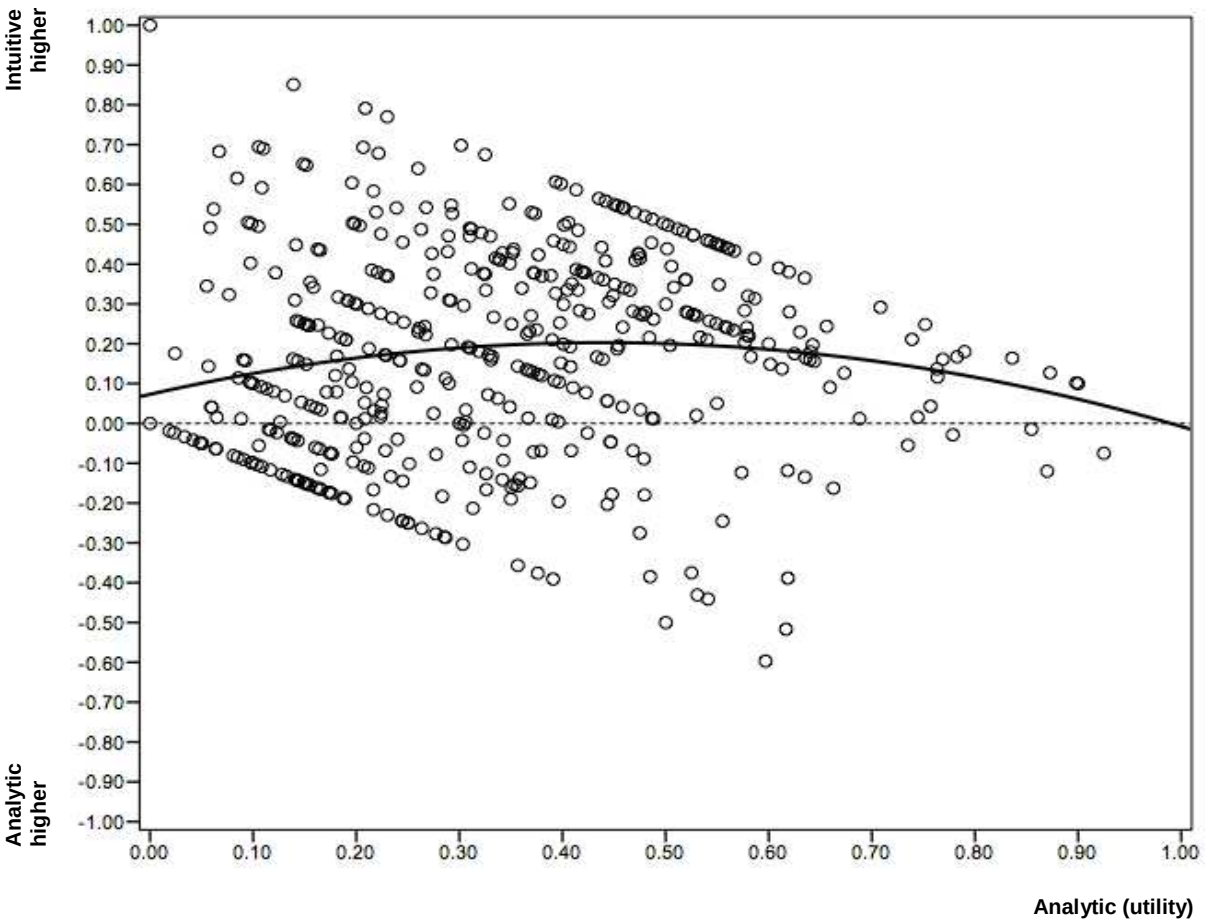


Figure 4.3 Difference between analytic (utility) and intuitive (desirability) assessment of urban planning scenarios (all stakeholders)

Note: n = 80 (458 observations).

4.3.2. Social conflict analysis

4.3.2.1 Dissent hypothesis

All stakeholder groups prefer sustainable districts, but also show dissent in many scenarios (cf. Figure 4.4). There is dissent concerning the desirability and probability of the returnee district ($F_{d(32)}(2,78) = 5.35$, $p_{d(32)} = .006$; $F_{p(32)}(2,78) = 3.50$, $p_{p(32)} = .034$). Housing suppliers view the returnee district as less desirable ($t_{d(32)}(79) = -3.06$, $p_{d(32)} = .009$ compared to the non-profit & public sector; $t_{d(32)}(79) = -2.63$, $p_{d(32)} = .030$ compared to housing target groups). The non-profit & public sector is less confident than housing target groups that the returnee district is a probable scenario ($t_{p(32)}(79) = -2.64$, $p_{p(32)} = .029$). With regard to the family district, no dissent was detected between stakeholder groups.

Of all scenarios, the social district shows the greatest dissent on probability ($F_{p(22)}(2,78) = 11.77$, $p_{p(22)} < .001$). The non-profit & public sector is less confident about its probability than housing suppliers and housing target groups ($t_{p(22)}(79) = -2.77$, $p_{p(22)} = .020$ compared to housing suppliers; and $t_{p(22)}(79) = -4.83$, $p_{p(22)} < .001$ compared to housing target groups).

The transitory district prompts dissent among stakeholders concerning desirability ($F_{d(12)}(2,78) = 5.19$, $p_{d(12)} = .007$). The non-profit & public sector view the transitory district as less desirable than other stakeholder groups: ($t_{d(12)}(79) = -2.62$, $p_{d(12)} = .030$ compared to housing suppliers; $t_{d(12)}(79) = -2.91$, $p_{d(12)} = .013$ compared to housing target groups).

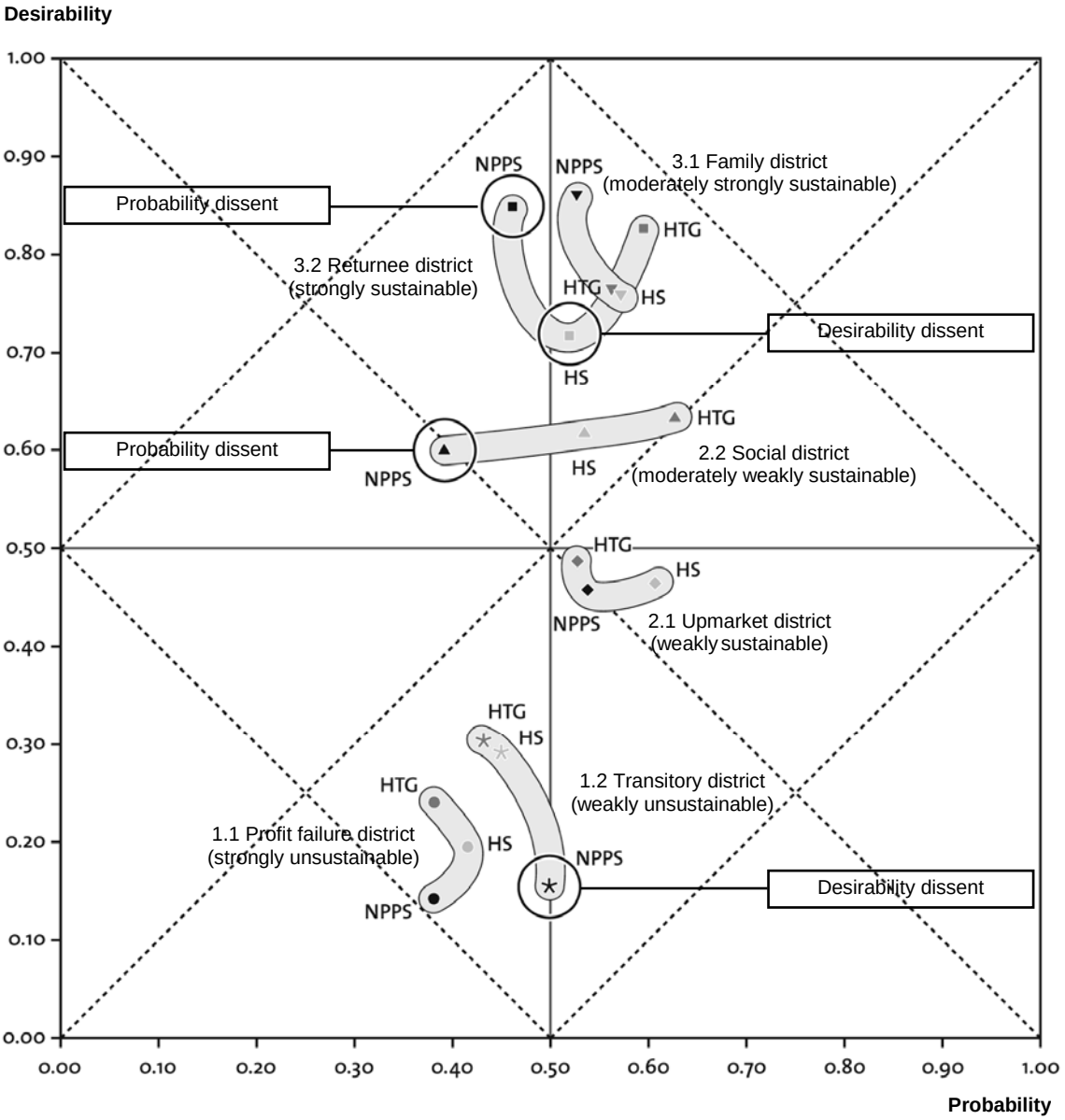


Figure 4.4 Social conflict analysis: mean values of desirability vs. probability assessments (by stakeholder groups)

Note: *n* = 80 (458 observations). Highlighted data points of a stakeholder group denote significant dissent with the other stakeholder groups investigated. Abbreviations used for stakeholder groups are: HS (housing suppliers), NPPS (non-profit & public sector), and HTG (housing target groups).

4.3.2.2 Optimal solution hypothesis

As we have seen, there is more dissent among stakeholder groups on sustainable than on unsustainable districts. The urban planning scenarios with the highest desirability and utility for all stakeholder groups are sustainable districts. Sustainable districts are not less probable for stakeholders than business-as-usual districts. There is dissent between stakeholder groups in

the assessment of the returnee district but not of the family district. Therefore, stakeholders view a family district to be the best starting point for Erlenmatt from the set of scenarios studied.

4.4 Discussion

In the following section, we present the implications of the results and discuss the lessons learned for the planning of urban transitions.

4.4.1 Detailed individual assessment

The sustainability hypothesis (H_1) was supported for Erlenmatt. In line with the findings of Evans and Jones (2008), our detailed individual assessments showed that sustainability of scenarios is positively correlated with desirability and utility. At the same time, this result suggests that our systematically varied scenarios were in fact recognizable as representing different quality with respect to sustainability. More importantly, and in contrast to Evan and Jones (2008), we also can show that sustainable scenarios are judged to be as probable as business-as-usual, at least for Erlenmatt and the set of scenarios studied. As Bulkeley (2006) notes, this could be due to changing legislation and regulation, but it also could be due to changing societal views and business strategies concerning sustainability. The latter might make the perception of the feasibility of sustainable urban transitions equally as probable as other possible future development paths.

The cognitive system hypothesis (H_2), which claims that the intuitive assessment of a scenario is higher than the analytical assessment, was supported. This suggests that the intuitive and analytic modes of thinking differ from each other (Scholz, 1987). Decisions in the real estate sector are to be more based on analytical than on intuitive processing, as the consequences of poor decisions can have long-term detrimental effects on their individual benefit. It is instructive to design studies that aim at intuitive and analytic assessments of stakeholders. The utility assessment for Erlenmatt is, in fact, generally lower than the desirability assessment. This would suggest that simple preference ratings might lead to an overestimation. As future studies are restricted to collecting stated rather than revealed preferences (cf. Adamowicz, Louviere and Williams, 1994), further research has to show whether revealed preference values are closer to the intuitive or the analytical assessment. However, based on the rationale presented above, such decisions might tend to be analytical, at least for the non-profit & public sector and housing suppliers.

4.4.2 Social conflict analysis

The dissent hypothesis (H_3) was supported by substantial dissent among the assessments of stakeholder groups. The non-profit & public sector is more pessimistic about the probability of sustainable districts for Erlenmatt, but desires them more. Housing suppliers, on the other hand, show less desire for a strongly sustainable district. This finding is possibly related to the failure to implement sustainable development due to market profit orientations (Mangahas and Guerrero, 2002). This finding suggests a belief that higher quality means higher cost or decrease in financial return, which does not always hold true (Seokijn and Nakhai, 2008). The greatest dissent exists between the housing target groups and the non-profit & public sector. Housing target groups are the most optimistic about sustainable development for Erlenmatt. This finding could be related to a high expectation of sustainability in public participation (Marschalek, 2008). With respect to the housing target groups, however, we have to be cautious in interpreting any difference, because this group response rate was substantially lower than in the other stakeholder groups. In fact, it was more difficult to recruit respondents from the general public. Many of them were less interested, professionally less concerned or less motivated than housing suppliers or the non-profit & public sector to participate in an intensive interview session on urban planning.

All these differences point to potential fields of social conflict. Desirability dissent can lead to different scenarios being supported by lobbying for one over the other or by trying to delay or block the development of a less desired alternative. A difference in probability assessments among stakeholders can aggravate or complicate this social conflict, because people might act on the basis of their expected utility assessment (i.e., utility multiplied by its probability) rather than on their utility assessment alone. Therefore, the non-profit & public sector, for example, could take sides against housing target groups with respect to the social district, not because they desire it less, but because they perceive it as less probable. We argue that knowing about the different social conflict patterns allows for a more informed and focused discourse on sustainable urban transitions.

The optimal solution hypothesis (H_4) was supported by results showing that a moderately strongly sustainable district offers an optimal solution for Erlenmatt from the set of scenarios studied. It has the highest desirability and utility together with a strongly sustainable district, but shows no substantial dissent among stakeholder groups. Therefore, such moderately strongly sustainable districts could be used as promising starting points for sustainable urban transition

in the Erlenmatt area. The results also indicate a creative potential with which to reframe and coalesce the discussion of dissent (Evans and Jones, 2008; Priemus, 2007) by systematically designing a set of alternative scenarios and offering them for a detailed individual assessment.

4.4.3 Outlook on the case study

The feedback from the detailed individual assessment into urban planning may help foster a sustainable urban transition in the case study area. It provides urban planners with design components for sustainable districts with higher desirability and utility but the same probability as business-as-usual districts. Our results from the detailed individual assessment suggest that planning a family district or a returnee district is more favourable for a sustainable urban transition for Erlenmatt than a business-as-usual district. Also a social conflict analysis can inform future decisions in the case study area; in contrast to the strongly sustainable district, the moderately strongly sustainable district shows no dissent between stakeholder groups. Therefore planning a family district is a even more promising for a sustainable urban transition of the Erlenmatt than planning a returnee district.

4.4.4 Limitations of the study

There are some limitations to this study. The predefined criteria may not have covered all the different aspects of an intuitive assessment that the respondents had in mind. This might have led to an analytical assessment that is less accurate than the intuitive assessment in reflecting the respondents' preferences. Care should be taken when designing subjective scenario assessments. According to Lombardi (2002), there are problems in terms of a clear understanding of sustainability in the built environment and in evaluating sustainability in planning and design. First, evaluating sustainability may lead to a biased response called social desirability. Social desirability occurs when the respondent chooses an answer he or she believes to be socially more acceptable than the respondent's actual opinion. Second, the high number and complexity of design components were demanding in the present study. In this context, housing suppliers and the non-profit & public sector turned out to be more independent and potentially better trained in social debates and research settings. Moreover, they tend to be more active, interested and professionally concerned in assessing urban planning scenarios than housing target groups. Accordingly, the influence of sustainability on desirability, utility and probability in assessing scenarios has to be confirmed in future studies.

4.5 Conclusions

Five main conclusions can be drawn from the present study. First, sustainable districts are preferred both intuitively (desirability) and analytically (utility). Second, planners need to be aware that the intuitive and analytical assessment of the attractiveness of scenarios can differ considerably. Third, sustainable districts are perceived as being as probable as business-as-usual districts. Fourth, it was possible to identify dissent in the assessment of urban planning scenarios between stakeholder groups. Fifth, consensus between stakeholders is more promising with moderately strongly sustainable districts than with strongly sustainable districts.

A scenario assessment of alternative future states in urban planning that covers a detailed individual assessment and a social conflict analysis should be able to support an informed and focused discourse on sustainable urban transitions. In particular, the scenario assessment indicated that the development of the Erlenmatt toward a moderately strongly sustainable district is the best starting point for a sustainable urban transition that is accepted by stakeholder groups. A detailed and multi-faceted scenario assessment can be used to inform sustainable urban transition. Using detailed individual assessments by different stakeholder groups can complement an economic cost-benefit analysis of the future building stock. It supports planning that is accepted by stakeholders. Yet, like regional foresight, it can only complement public planning processes and it must be followed by more inclusive democratic processes (Hanssen, Johnstad and Klausen, 2009; Falleth, Hanssen and Saglie, 2010). Also, it is essential to acknowledge that “the aggregation of individual consumer preferences ignore and weaken the fundamental democratic trusteeship” (Sager, 2009, p. 72). Such a procedure can inform communicative planners as well, because they can obtain a broad overview of the existing wishes and preferences among stakeholders. Collecting judgments and preferences in a transparent and comprehensive manner does not mean that stakeholders are just “expressing a preference in a market place through willingness to pay” (Imrie, 1999, p. 116), but that much broader considerations are possible. Comparing individual assessments between stakeholder groups can help to anticipate potential social conflicts at different levels and to identify zones of agreement. Such knowledge can inform subsequent more deliberatively oriented planning processes but not replace them. Both subjective assessments and social conflict analysis can play a vital role in sustainable urban transition.

4.6 Acknowledgements

This research project is funded by a grant from the Swiss National Science Foundation (SNSF) as part of its National Research Programme (NRP) 54 "Sustainable Development of the Built Environment" (Project Number 405440-107075/1). The authors thank Harald A. Mieg, Corinne Moser, Anja Peters, Andy Spörri, Daniel Wiener, Stefan Zemp, the Planning Department of the Canton of Basel-Stadt and the primary case study partner (Vivico Real Estate GmbH) for their support and helpful suggestions; and Sandro Bösch for his graphical support on Figure 4.4.

4.7 References

ADAMS, D. (2004) The changing regulatory environment for speculative housebuilding and the construction of core competencies for brownfield development, **Environment and Planning A**, 36, pp. 601-624.

ADAMOWICZ, W., LOUVIERE, J. and WILLIAMS, M. (1994) Combining Revealed and Stated Preference Methods for Valuing Environmental Amenities, **Journal of Environmental Economics and Management**, 26, pp. 271-292.

AZERRAD, J.M. and NILON, C.H. (2006) An evaluation of agency conservation guidelines to better address planning efforts by local government, **Landscape and Urban Planning**, 77, pp. 255-262.

BACCINI, P. (1996) Understanding Regional Metabolism for a Sustainable Development of Urban Systems, **Environmental Science and Pollution Research**, 3, pp. 108-111.

BRUEGGEMAN, W.B. and FISHER, J.D. (2008) **Real Estate Finance and Investments** (13th ed.). Boston, MA: McGraw-Hill.

BULKELEY, H. (2006) Urban sustainability: learning from best practice?, **Environment and Planning A**, 38, pp. 1029-1044.

BUTTON, K. (2002) City management and urban environmental indicators, **Ecological Economics**, 40, pp. 217-233.

CHOGUILL, C.L. (2007) The search for policies to support sustainable housing, **Habitat International**, 31, pp. 143-149.

COOK, M. (2007) **The Design Quality Manual: improving building performance**. Oxford: Blackwell.

CUNNINGHAM, J.B. (1997) Case study principles for different types of cases, **Quality &**

Quantity, 31, pp. 401-423.

DAWSON, R.J. (2011) Potential pitfalls on the transition to more sustainable cities and how they might be avoided, **Carbon Management**, 2, pp. 175-188.

DENES-RAJ, V. and EPSTEIN, S. (1994) Conflict Between Intuitive and Rational Processing: When People Behave Against Their Better Judgment, **Journal of Personality and Social Psychology**, 66, pp. 819-829.

EVANS, J. and JONES, P. (2008) Rethinking sustainable urban regeneration: ambiguity, creativity, and the shared territory, **Environment and Planning A**, 40, pp. 1416-1434.

FALLETH, E.I., HANSSEN, G.S., and SAGLIE, I.L. (2010) Challenges to Democracy in Market-Oriented Urban Planning in Norway, **European Planning Studies**, 17, pp. 1733-1750.

GOODLAND, R. (1992) The Case That the World Has Reached Limits: More Precisely That Current Throughput Growth in the Global Economy Cannot be Sustained, **Population and Environment**, 13, pp. 167-182.

GOSPODINI, A. (2005) Urban development, redevelopment and regeneration encouraged by transport infrastructure projects: The case study of 12 European cities, **European Planning Studies**, 13, pp. 1083-1111.

GREGORY, R., FISCHHOFF, B. and MCDANIELS, T.L. (2005) Acceptable Input: Using Decision Analysis to Guide Public Policy Deliberations, **Decision Analysis**, 2, pp. 4-16.

HAASE, D., HAASE, A., KABISCH, S. and BISCHOFF, P. (2008) Guidelines for the "Perfect Inner City": Discussing the Appropriateness of Monitoring Approaches for Reurbanization, **European Planning Studies**, 16, pp. 1075-1100.

HANSSEN, G.S., JOHNSTAD, T., and KLAUSEN, J.E. (2009) Regional Foresight, Modes of Governance and Democracy, **European Planning Studies**, 17, pp. 1733-1750.

HERMELIN, B. (2009) Spatial Strategic Planning in the Stockholm Region - Discourses on the Space-economy and Growth Factors, **European Planning Studies**, 17, pp. 131-148.

HOWLEY, P., SCOTT, M. and REDMOND, D. (2009) Sustainability versus liveability: an investigation of neighbourhood satisfaction, **Journal of Environmental Planning and Management**, 52, pp. 847-864.

IMRIE, R. (1999) The Implications of the `New Managerialism' for Planning in the Millennium, in P. Allmendinger and M. Chapman (Eds) **Planning Beyond 2000**, pp. 106–120. London: John Wiley.

JIM, C.Y. (2004) Green-space preservation and allocation for sustainable greening of compact cities, **Cities**, 21, pp. 311-320.

KOHLER, N. and HASSLER, U. (2002) The building stock as a research object, **Building Research & Information**, 30, pp. 226-236.

KRIESE, U. and SCHOLZ, R.W. (2011) The Positioning of Sustainability within Residential Property Marketing, **Urban Studies**, 48, pp. 1503-1527.

KRIESE, U., BÜGL, R. and SCHOLZ, R.W. (accepted). Market Actors' Views on Urban Family Living: Informing Urban Planning and Place Marketing in Preparation for Urban Transitions. **European Planning Studies**.

LAWS, D., SCHOLZ, R.W., SHIROYAMA, H., SUSSKIND, L., SUZUKI, T. and WEBER, O. (2004) Expert views on sustainability and technology implementation, **International Journal of Sustainable Development & World Ecology**, 11, pp. 247-261.

LO, S.M., ZHAO, C.M. and CHENG, W.Y. (2006) Perceptions of building professionals on sustainable development: A comparative study between Hong Kong and Shenyang, **Energy and Buildings**, 38, pp. 1327-1334.

LOMBARDI, P.L. (2002) Evaluating Sustainability in Planning and Design, in M. Canavari, P. Caggiati and K.W. Easter (Eds) **Economic Studies on Food, Agriculture, and the Environment**, pp. 269-280. New York, NY: Kluwer Academic/Plenum Publishers.

LOUKOPOULOS, P. and SCHOLZ, R.W. (2004) Sustainable future urban mobility: using 'area development negotiations' for scenario assessment and participatory strategic planning, **Environment and Planning A**, 36, pp. 2203–2226.

MAJOOR, S.J.H. (2009) The Disconnected Innovation of New Urbanity in Zuidas Amsterdam, Ørestad Copenhagen and Forum Barcelona, **European Planning Studies**, 17, pp. 1379-1403.

MANGAHAS, M. and GUERRERO, L.L. (2002) Self-Sustained Quality of Life Monitoring: The Philippine Social Weather Reports, **Social Indicators Research**, 60, pp. 123-144.

MARSCHALEK, I. (2008) The concept of participatory local sustainability projects in seven Chinese villages, **Journal of Environmental Management**, 87, pp. 226-235.

MCDERMOTT, P. (1998) Positioning planning in a market economy, **Environment and Planning A**, 30, pp. 631-646.

MEIJER, F., ITARD, L. and SUNIKKA-BLANK, M. (2009) Comparing European residential building stocks: performance, renovation and policy opportunities, **Building Research & Information**, 37, pp. 533-551.

PATI, D., PARK, C.S. and AUGENBROE, G. (2009) Roles of quantified expressions of building performance assessment in facility procurement and management, **Building**

and Environment, 44, pp. 773-784.

PRÄSIDIALDEPARTEMENT DES KANTONS BASEL-STADT (2008) **Kantons- und Stadtentwicklung**. Basel: Präsidialdepartement des Kantons Basel-Stadt (available at: http://www.entwicklung.bs.ch/ [retrieved 02 July 2011]).

PRIEMUS, H. (2007) System Innovation in Spatial Development: Current Dutch Approaches, **European Planning Studies**, 15, pp. 991-1006.

PRIEMUS, H. (2010) Mega-projects: Dealing with Pitfalls, **European Planning Studies**, 18, pp. 1023-1039.

PRUITT, D.G. and KIM, S.H. (2004) **Social Conflict: Escalation, Stalemate, and Settlement** (3rd ed.). New York, NY: McGraw-Hill.

RATCLIFFE, J., STUBBS, M. and KEEPING, M. (2009) **Urban Planning and Real Estate Development** (3rd ed.). London: Routledge.

RAYNER, T. (2004) Sustainability and Transport Appraisal: The Case of the "Access to Hastings" Multi-modal Study, **Journal of Environmental Assessment Policy and Management**, 6, pp. 465-491.

REGIERUNGSRAT DES KANTONS BASEL-STADT (RR-BS) (2004) **Stadtteil-entwicklungsplan Integrale Aufwertung Kleinbasel IAK: Ausgabe 2004**. Basel: Druckerei Thoma AG (available at: http://www.baselnord.bs.ch/ [retrieved 02 July 2011]).

REGIERUNGSRAT DES KANTONS BASEL-STADT (RR-BS) (2005) **Zukunft Basel konkret: Bericht zur nachhaltigen Entwicklung Basel-Stadt 2005**. Basel: Kreis Druck AG (available at: http://www.statistik-bs.ch/ [retrieved 02 July 2011]).

REGIERUNGSRAT DES KANTONS BASEL-STADT (RR-BS) (2010) **Erlenmatt: Geschäfte**. Basel: Parlamentsdienst des Grossen Rates (available at: http://www.grosserrat.bs.ch/ [retrieved 18 July 2011]).

SAGER, T. (2009) Planners' Role: Torn Between Dialogical Ideals and Neo-liberal Realities, **European Planning Studies**, 17, pp. 65-84.

SCHETKE, S. and HAASE, D. (2008) Multi-criteria assessment of socio-environmental aspects in shrinking cities. Experiences from eastern Germany, **Environmental Impact Assessment Review**, 28, pp. 483-503.

SCHOLZ, R.W. (1987) **Cognitive Strategies in Stochastic Thinking**. Dordrecht: D. Reidel Publishing Company.

SCHOLZ, R.W. (2011) **Environmental Literacy in Science and Society: From Knowledge to Decisions**. Cambridge: Cambridge University Press.

SCHOLZ, R.W. and STAUFFACHER, M. (2007) Managing transition in clusters: area development negotiations as a tool for sustaining traditional industries in a Swiss prealpine region, **Environment and Planning A**, 39, pp. 2518-2539.

SCHOLZ, R.W. and TIETJE, O. (2002) **Embedded Case Study Methods: Integrating Quantitative and Qualitative Knowledge**. Thousand Oaks, CA: Sage Publications.

SEOKIJN, K. and NAKHAI, B. (2008) The dynamics of quality costs in continuous improvement, **International Journal of Quality & Reliability Management**, 25, pp. 842-859.

SINUS SOCIOVISION GMBH (2007) **Die Sinus-Milieus®**. Heidelberg: Sinus Sociovision GmbH (available at: http://www.sinus-institut.de/en/ [retrieved 18 July 2011]).

STATISTISCHES AMT DES KANTONS BASEL-STADT (2008) **Statistik Basel-Stadt**. Basel: Statistisches Amt des Kantons Basel-Stadt (available at: http://www.statistik-bs.ch/ [retrieved 18 July 2011]).

STAUFFACHER, M., FLÜELER, T., KRÜTLI, P. and SCHOLZ, R.W. (2008) Analytic and dynamic approach to collaborative landscape planning: a transdisciplinary case study in a Swiss pre-alpine region, **Systemic Practice and Action Research**, 21, pp. 409-422.

SUSSKIND, L.E., MCKEARNEN, S. and THOMAS-LAMAR, J. (Eds) (1999) **The Consensus Building Handbook: A Comprehensive Guide to Reaching Agreement**. Thousand Oaks, CA: Sage Publications.

SWISS FEDERAL STATISTICAL OFFICE (SFSO) (2004) **Sustainable Development in Switzerland: Indicators and Comments**. Neuchâtel: SFSO (available at: http://www.bfs.admin.ch/ [retrieved 18 July 2011]).

SWISS FEDERAL STATISTICAL OFFICE (SFSO) (2007) **Einkommens- und Verbrauchserhebung 2004 (EVE 2004). Kommentierte Ergebnisse und Tabellen**. Neuchâtel: SFSO (available at: http://www.bfs.admin.ch/ [retrieved 12 March 2011]).

SWISS FEDERAL STATISTICAL OFFICE (SFSO) (2008a) **Statistical Data on Switzerland 2008**. Neuchâtel: SFSO (available at: http://www.bfs.admin.ch/ [retrieved 18 July 2011]).

SWISS FEDERAL STATISTICAL OFFICE (SFSO) (2008b) **Labour market indicators for 2008. Comments on findings for the period 2002-2008**. Neuchâtel: SFSO (available at: http://www.bfs.admin.ch/ [retrieved 18 July 2011]).

SWISS FEDERAL STATISTICAL OFFICE (SFSO) (2008c) **Swiss Population Census 2000**. Neuchâtel: SFSO (available at: http://www.bfs.admin.ch/ [retrieved 18 July 2011]).

SWISS FEDERAL STATISTICAL OFFICE (SFSO) and FEDERAL OFFICE FOR SPATIAL DEVELOPMENT (ARE) (2007) **Mobilität in der Schweiz: Ergebnisse**

des Mikrozensus 2005 zum Verkehrsverhalten. Neuchâtel: SFSO (available at: http://www.bfs.admin.ch/ [retrieved 18 July 2011]).

UNITED NATIONS HUMAN SETTLEMENTS PROGRAMME (UN-HABITAT) (2009) **Planning Sustainable Cities-Global Report on Human Settlements 2009**. London: Earthscan.

VIVICO REAL ESTATE GMBH (2008) **Erlenmatt – Dedicated to urban life: A new district for Basel**. Basel: Vivico Real Estate GmbH (available at: http://www.caimmo-deutschland.de/en/home.html [retrieved 02 July 2011]).

WANG, F.A. (2001) Overconfidence, Investor Sentiment, and Evolution, **Journal of Financial Intermediation**, 10, pp. 138-170.

WIEK, A., BINDER, C.R. and SCHOLZ, R.W. (2006) Functions of scenarios in transition processes, **Futures**, 38, pp. 740-766.

ZANDVLIET, R., BERTOLINI, L. and DIJST, M. (2008) Towards Planning for a Mobile Society: Mobile and Residential Populations and the Performance of Places, **European Planning Studies**, 16, pp. 1459-1472.

5 Concluding remarks

5.1 Summary of results: Main insights from the studies

The thesis showed that urban systems with their human and environmental matrix provide design components that can either foster or hinder the expression of sustainable lifestyles. In turn, lifestyles are a design component of urban systems that influences if an urban development is sustainable or not. Following the idea of inextricably coupled human-environment systems, the contributions of the thesis provided several insights in regard to lifestyle research. Firstly, the lifestyle review showed that lifestyles consist of patterns of thinking and behaviour, habits, symbolic motives, and social identity that are dependent on human and environmental drivers. In turn, lifestyles have human and environmental consequences on urban development. Secondly, the study on S-REFs suggests that a sustainable social infrastructure can aid urban citizens to express more sustainable lifestyles. S-REFs are a sustainable property investment instrument that can help the realization of such a sustainable social infrastructure. Accordingly, investors provide a supply of built environments together with other stakeholders, which either foster or hinder dwellers to express sustainable lifestyles. Thirdly, the scenario assessment showed that lifestyle is a design component for a sustainable urban transition. Such a scenario assessment can be used in an early stage to identify future urban districts with a high desirability, utility, and probability, and the least dissent between different stakeholder groups. A consistent preference for a future urban district across different assessment indicators and a high consent between stakeholder groups is therefore important for building projects to be successful in urban planning. These results suggest that several types of drivers are crucial for responsible property investment and urban planning.

5.1.1 Urban and housing studies

The lifestyle review showed that a sustainable urban development has to address several fields of transition: energy & mobility, residential living, health care, working sphere consumption patterns, leisure-time activities, and social networking. For successful urban

planning, these fields of transition cannot be uncoupled from lifestyles and a sustainable social infrastructure that address the development of human and environmental systems. For this reason, a process-structure model that includes lifestyles in the framework of human-environment systems can be useful in planning sustainable cities (cf. Guy & Marvin, 1999; Scholz, 2011). A deeper knowledge of processes and structures that influence the actualization of lifestyles provides insights on the incentive-barrier structures that are linked to sustainable lifestyle. Therein, lifestyle research can inform urban planning towards an enhanced management of ecological system limits that foster sustainability (cf. Laws *et al*., 2004).

The study on S-REFs showed that key financial stakeholders hold distinct views with regard to sustainability criteria for real estate funds. Accordingly, building materials and energy, expenses, return and flexibility, green space design, landscape and natural ecology, and sustainable social infrastructure are sustainability criteria for S-REFs that are successful on the market. Accordingly, S-REFs need a system for social sustainability indicators, efficient technological systems and lifestyles in order to be sustainable and distinct from business as usual investment.

The scenario assessment showed that all stakeholder groups prefer a sustainable district on the Erlenmatt. A sustainable district is assessed to have the highest desirability and utility, and not less probable than a business as usual district. Housing suppliers are optimistic and are closing in on what housing target groups imagine for the Erlenmatt. Representatives of sustainable NGOs are less optimistic and are more likely to expect a profit-failure district on Erlenmatt. Moreover, the results of the scenario assessment suggest that a strongly sustainable district creates dissent between stakeholder groups. Their views differ substantially with respect to the probability of its expected development. In contrast, a moderately strongly sustainable district creates consent and is assessed to have desirability, utility and probability that are equal to a strongly sustainable district. Accordingly, a scenario assessment is an effective tool for informing stakeholders on possible pathways for sustainable urban transitions.

5.1.2 Sustainable property investment

The lifestyle review showed that investing in a sustainable social infrastructure could provide an environment that enhances the social sustainability of urban systems. Such a sustainable social infrastructure can aid in achieving social equality, as was described by Rawls (1999), and to achieve capability (Sen, 2001). Rawls (1999) attempts solving the problem of

distributive justice by employing a familiar application of the social contract. According to the principles of justice as defined by Rawls (1999), each person is to have an equal right to the most extensive scheme of basic liberties that are compatible with a similar scheme of liberties for others (the liberty principle). Moreover, social and economic inequalities are to be arranged so that they are to be of the greatest benefit to the least-advantaged members of society (the difference principle). Another claim is that offices and positions must be open to everyone under conditions of fair equality of opportunity. Enlarging such a scope of social sustainability, Sen (2001) argued for freedom in the assessment of a person's advantage, individual differences in the ability to transform resources into valuable activities, a fair distribution, and against an excessive materialism in the evaluation of welfare within society.

Within the scope of this thesis, results from the lifestyle review suggest sustainability investments can serve for increasing the capability and social equality in housing. They enhance the social infrastructure in urban systems and could make them equally available to all citizens. A sustainable social infrastructure provides an environment of urban services that attracts people in search of such a neighbourhood (cf. Blokland, 2008; Harth, Herlyn & Scheller, 1998; Talen, 1997). Applied in formerly distressed neighbourhoods, sustainability investments could thus help to induce a process of gentrification and social restratification, as was described by Blasius and Friedrichs (2008). Housing suppliers and the non-profit & public sector can offer such sustainable urban environments if they shape the environmental matrix of urban systems by such sustainability investments in social infrastructure. These results are in line with Kriese and Scholz (2011), who argue that builders and investors influence the appearance and quality of landscape and urban space, the supply and design of domestic space, and the social environment. Today, however, the danger is that investors are buying more into the commodity ideology, making it a self-fulfilling prophecy (Schrage, 2007). This creates social inequality and incapable urban systems by marginalising underprivileged residents and pushing them into social ghettos with a lack of social infrastructure. A sustainable property investment therefore requires a sustainability learning of investors through market feedback mechanisms as well as interdisciplinary and transdisciplinary action that integrates different science and practice communities (cf. Sayce, Ellison & Parnell, 2007; Scholz *et al*., 2006). This may help investors in the realisation that sustainable ecological and social investment in urban systems will effectively pay off compared to business as usual in the long run.

The study on S-REFs showed that cognitive drivers, institutional context and socio-demographic controls are related to key financial stakeholders' market acceptance of such funds. In particular, an anticipated sustainability management effect of S-REFs is related to a substantially higher market acceptance of S-REFs by key financial stakeholders. In contrast, environmental apathy decreases key financial stakeholders' market acceptance of S-REFs. S-REFs create a supply of sustainable building stock which may attract and foster the expression of sustainable lifestyles. The results help to introduce S-REFs in the finance market in order to understand the investment behaviour of institutional real estate investors and the supply of such funds. The study on S-REFs showed that key financial stakeholders weigh social sustainability criteria lower for the design of S-REFs than economic and ecological ones. In addition, key financial stakeholders' views on economic sustainability criteria are more dominant for their assessment of market success than their views on ecological sustainability criteria. These results suggest that key financial stakeholders are in need of support from sustainability experts when designing a real estate fund that is more than economically sustainable. The study also showed that the stock of sustainable real estate in Switzerland, as well as the volume of S-REFs, is critical. As sustainable building projects in top-level sites are very scarce today, there is a need for S-REFs to invest in sustainable construction and the sustainable redevelopment of formerly distressed building stocks. Both strategies need a sustainability learning and transdisciplinary action for the development of S-REFs that are successful in a market economy.

The scenario assessment showed that sustainable districts are not only preferred by housing target groups and the non-profit & public sector, but also by housing suppliers. Housing suppliers, however, have less of a desire for a strongly sustainable district than other stakeholder groups. These results may be due to the belief of many housing suppliers that strongly sustainable districts are over-proportional cost drivers that outweigh their expected return. A moderately strongly sustainable district, however, shows consent between all stakeholder groups. Such sustainable districts provide attractive housing for social milieus with a sustainable lifestyle, and cover sustainability investments in ecodesign, buildings, finance and social infrastructure. These results suggest that a moderately strongly sustainable district is acceptable not only for the non-profit & public sector and housing target groups, but also for housing suppliers.

5.1.3 Lifestyles and sustainable urban development

The thesis investigated design components that are drivers or consequences of lifestyles. Lifestyles interact with urban built environments, and urban built environments influence lifestyles. In turn, lifestyles are able to shape built environments in the long run by a supply change of the built and social environment. Cognition and behaviour, socio-demography, situation and socio-culture are important design components that influence the actualization of lifestyles. In particular, the thesis found that sustainable real estate funds, social milieu, ecodesign, buildings, finance, social infrastructure, the views of different stakeholder groups and participative processes are important design components of sustainable urban systems. Knowledge of the actualization of lifestyles, real estate investment mechanisms, and scenario assessments can provide informative and in-depth guidance for the sustainable transition of urban systems. Such a sustainable transition of urban systems has not only to integrate the incentive-barrier structures to implement efficient technologies, but also to foster more sustainable lifestyles of urban citizens. Besides the impact of technological efficiency on a sustainable development, lifestyles are a design component for the transition of urban systems towards sustainability. Managing the incentive-barrier structures of sustainable urban systems is therefore crucial for enabling sustainable urban lifestyles. The design components of urban systems may aid in structuring improvements on the material and cultural spheres of lifestyles that eliminate system disparities and enhance the capability of urban systems. As a consequence, such a conceptualization of lifestyles that is based on coupled human-environment systems can be used to structure the planning of sustainable urban transitions.

5.2 Theoretical and methodological conclusions

5.2.1 Theoretical conclusions

The thesis provided a lifestyle definition that is based on the interdisciplinarity of psychology and sociology that is enriched by results from natural and social sciences, a synthesis of three traditional strands of lifestyle research, and the framework of human-environment systems. Essentially, lifestyles consist of patterns of thinking and behaviour. Some patterns of thinking and behaviour form habits by repeated practice and stability, and are enriched by symbolic motives (Steg, 2005) that create a social identity (Tajfel & Turner, 1986). In particular, this thesis provides a balanced integration of distinction and affiliation using the theory of social

identity. Much lifestyle research has focused on the need for distinction and has neglected the need for affiliation for a deeper understanding of social identity and social cognition (cf. Fiske & Taylor, 2008; Tajfel & Turner, 1986). Individuals create social identity through their need for distinction, affiliation and identification, which were identified by Steg (2005) to be symbolic motives of behaviour. Social identity again serves for social cognition, i.e. how people form impressions and categorize other people, especially based on socio-demography (e.g., race, gender, age, class), but also with respect to lifestyle (cf. Fiske & Taylor, 2008). The habitus, as described by Bourdieu (2007), is a design component of lifestyles that provides the socio-cultural matrix that influences our patterns of thinking and behaviour, and ultimately our habits.

Consumer, health and housing lifestyles can be used as cognitive-behavioural templates to organise the description of sustainable lifestyles. Known examples of sustainable lifestyles were a voluntary simplifier lifestyle (McDonald *et al*., 2006), a frugal lifestyle (Lastovicka *et al*., 1999), and a green lifestyle (Rifkin, 1990). A voluntary simplifier lifestyle describes people who can afford, but reject to express, a lifestyle of wasteful consumption. A frugal lifestyle describes a style of consumption that rejects materialism independently of the economic capital that is available to people. Both a voluntary simplifier lifestyle and a frugal lifestyle concentrate on consumption. A green lifestyle concentrates on the saving of natural resources. The shortcoming of these lifestyle approaches is that they rather focus on consumption than on health and housing, and do not integrate a detailed understanding of feedback loops. In contrast, a cognitive-behavioural lifestyle theory, as was described in this thesis, provides a theory of action that is based on the mutual dependency of human and environmental systems and integrates not only consumption, but also health and housing.

The study of lifestyles shows that the application of HES allows for a more thorough understanding of human thinking and behaviour. Again, lifestyles play a role for an environmental literacy of natural and social science disciplines (cf. Scholz, 2011). Firstly, theoretical and empirical results from the thesis suggest that human and environmental systems are complementary (P1: Complementarity). Lifestyles, as well as sustainable property investment, depend on both the human and environmental matrix of decision-making, and produce human and environmental outcomes. Secondly, there is a hierarchy of human systems (P2: Hierarchy). The results of the thesis suggest that lifestyles, the market acceptance of S-REFs and the desirability, utility and probability of future urban districts are not only dependent on cognitive drivers and socio-demography of individuals, but also on the

stakeholder groups and types of institutions in which they are employed. Thirdly, there are disruptive interactions among and within different levels of urban systems, particularly between the level of individuals, institutions and the urban community (P3: Interference). Fourthly, the thesis suggests that there are feedback loops in the housing market and that there is a need for sustainability learning of housing suppliers (P4: Feedback). The supply of the built environment shapes the expression of dwellers' lifestyles, whereas lifestyles shape the supply of the built environment only by demand through the long run. Fifthly, lifestyles serve for a decision theoretic conception of human systems (P5: Decision). Results from the thesis suggest that lifestyles play a motivational role in decision-making. Moreover, the thesis revealed predictors of the market acceptance of S-REFs, and that sustainability and different subjective assessment indicators influence the preferences of future urban districts. Sixthly, human systems have different types of environmental awareness (P6: Awareness). For example, results from this thesis suggest that a low degree of environmental awareness is a negative predictor of key financial stakeholders' market acceptance of S-REFs. HES can thus be used in psychology, sociology, economics, medicine, urban studies and environmental sciences to inform the actualization of lifestyles and the design of sustainable urban transitions.

5.2.2 Methodological conclusions

5.2.2.1 Two-step study: Sustainability criteria and market acceptance of S-REFs

The study on S-REFs applied a two-step study for identifying and assessing sustainability criteria for S-REFs. The first step of the procedure used focus groups with institutional real estate investors, REF suppliers, sustainable financial experts, real estate assessment experts, and architects in order to identify sustainability criteria. The second step used a questionnaire study with institutional investors and REF suppliers in order to assess their importance for the market success of S-REFs, and the market acceptance of such funds. We applied a two-step study in order to sample different respondents who identify sustainability criteria and those who assess their importance for the market success of S-REFs. The study of S-REFs can further benefit from a combination of subjective assessments of stakeholders with research designs that are integrating life-cycle assessments and feedback loops of the natural, social and built environment. An opinion poll elicits stated preferences rather than revealed preferences. The high proportion of institutions deciding for an investment may, therefore, be overestimated (cf. O'Conor, Johannesson & Johansson, 1999). It is, however, difficult to elicit revealed

preferences as long as S-REFs have not reached the stage of market introduction. When S-REFs are established in the market, studies on their market acceptance should thus change to measuring revealed preferences. As sustainable property investments are related to an image benefit for investing institutions, economic motives may drive a sustainability investment of commercial investors (Hahn & Scheermesser, 2006). In Switzerland, institutional real estate investors, especially pension funds, are key financial stakeholders for S-REFs (Swiss Funds Association (SFA), 2010). In many other countries, this situation may differ considerably, as private investors have higher investment volumes in sustainable property investments than institutional investors. For a comparative study between countries, key financial stakeholders should thus include REF suppliers, institutional investors, and private investors.

5.2.2.2 Scenario assessment: Erlenmatt Exploration Parcours

A scenario assessment has not only to integrate the built environment, but also lifestyles and other design components in order to predict future urban development appropriately. In an early stage of planning, scenario assessment reveals a broad range of planning options for a possible future development (cf. Scholz and Tietje, 2002). The adequate point in time for integrating a scenario assessment in the decision-making process of urban planning and its use for consensus-building processes are case-sensitive. Firstly, some key decisions were already determined in the plans of zoning, building, and green space development. The consequence was a restricted range of decision alternatives, and less variation in meaningful planning scenarios. That is, the more degrees of freedom that remain in planning before a scenario assessment takes place, the more creative and supportive it is for urban planning purposes. Accordingly, a scenario assessment is most supportive in a kick-off stage of planning design. This is done to assess how several degrees of freedom differ in their assessment before key decisions take place. Secondly, a structured consensus-building process, such as area development negotiation, city dialogue, or mediation, was not conducted using the insights of the scenario assessment. This might be due to the missing acceptance of such structured consensus-building processes as some decision-makers' resist in front of public participation, and the experience of loss of control and loss of power. Structured consensus-building processes therefore need a resilient design and an early implementation, using the insights of scenario assessments, which integrate the needs of different stakeholder groups in a transparent participative process.

5.3 Relevance of the results

5.3.1 Scientific relevance

The construction of the built environment and the consequences on lifestyles are determined by a large set of stakeholders. In the end, no stakeholder group is solely responsible for providing sustainable urban development and for influencing the lifestyles of dwellers. Investors, project developers, architects and the non-profit & public sector pass the buck to each other in being responsible for the lifestyles of dwellers and the sustainability in urban development. Investors' potential contribution to a sustainably built environment and the lifestyles of users is not well assessed, be it by themselves or by the public. The lifestyle concept can therefore provide a useful approach to draw the attention of investors and other stakeholders to their role and to their possible influence on the lifestyles of dwellers.

The development of the built environment can be better described, explained, and understood by integrating lifestyles in the functioning of urban systems. Built environments and lifestyles are mutually dependent aspects of daily life, with sustainably built environments being potentially able to influence lifestyles towards more sustainability. However, in the long run, sustainable lifestyles potentially influence the offering of built environments by means of market mechanisms. They include the demand of individuals or organizations, and the provision of sustainably built environments by housing suppliers and other stakeholder groups.

The development process, including the roles and strategies of stakeholders, shapes lifestyles and the built environment. Institutional real estate investors revealed potentially strong implications concerning the various fields of action in urban development and form. The self-conceptions of stakeholder groups concern differences in their perceived power of influencing various fields of action in developing urban systems. They may influence their negotiation strategies as well as the processes and outcomes in urban development projects. Furthermore, sustainability issues can be promoted more effectively when stakeholders are informed and are made aware of the specific strengths and weaknesses of different stakeholder groups.

Aspects of sustainability can be taken into consideration while operating and managing the structures and infrastructures of the built environment. Discounted cash-flow (DCF) methods, the investors' main decision-making tool for the assessment of expected

building project outcomes, neglect or prohibit the inclusion of non-monetarian sustainability costs and benefits. As a consequence, corrected DCF methods or even new assessment approaches might be needed in order to promote sustainable urban development. Such corrected DCF methods have to include the social and ecological return of building projects.

5.3.2 Practical relevance

Lifestyle research can contribute towards the further development of Erlenmatt. With regard to lifestyles, three conclusions can be drawn on the further development of the area. Firstly, a challenge of the development process will be to create a feeling of distinction on the Erlenmatt. The goal of such a development process is to make Erlenmatt "something special" with regard to sustainability and social identity. Developing the energy standard of Erlenmatt as part of the 2,000 Watt society with a high-quality built environment provides more of a distinction for Erlenmatt in comparison with the surrounding area of Kleinbasel. Thirdly, a feeling of affiliation and social identity can strengthen the social cohesion and the merging of different lifestyles within the district. In order to achieve these goals for a sustainable urban transition, sustainability investors need be involved with developing building plots on the Erlenmatt.

The scenario assessment showed that a moderately strongly sustainable district is the most promising development of Erlenmatt. Although a family district has the highest desirability, utility, and probability of all assessed future urban districts, it shows no substantial dissent among stakeholder groups. That is, a moderately strong sustainability of social milieu, ecodesign, building, finance and social infrastructure is preferred by all stakeholder groups.

The further development of Erlenmatt can benefit from improvements on social life, usages, environmental standards, participation, and transdisciplinarity. With regard to *social life*, the further development has to avoid the creation of a profit-failure district, both in terms of a social ghetto of the poor and a social ghetto of the rich. Measures to be taken include an improvement of accessibility, social services and the social networking within and between urban districts, district management yet in an early stage of development, and a sustainable design of buildings, floor plans and pricing. With regard to *usages*, Erlenmatt needs a variety of mixed usages that fit the needs of housing target groups and are accessible for dwellers of adjacent areas. Having a proportion of condominiums fosters a social stability of the social milieu on the Erlenmatt. Results from the scenario assessment suggest that the green space design of the

Canton has convinced the housing target groups. For a social activation of Erlenmatt, the mixed usages have to be versatile, family-friendly and mostly public, and must be implemented quickly. In particular, there is a need for care and design of social life. Ground floor usages, shops, offices, service businesses, and public facilities may serve this purpose, especially those which are not present yet in adjacent areas. With regard to the *environmental standard*, the energy standard has to fulfil the requirements of the 2,000 Watt society. Many respondents of the studies, especially parents of young families and life science personnel with a modern orientation, want that Erlenmatt's buildings will have high environmental quality standards. Housing suppliers were more reserved on such environmental quality standards. To create a "lighthouse building project" on Erlenmatt, which serves as a point of identification and distinction in Kleinbasel, requires that the planned 10% share of the 2,000 Watt society has to be realized in an early stage of development. With regard to *participation* and *transdisciplinarity*, a future-oriented dialogue process on the development of Erlenmatt may serve for discussion on such possible improvements. Many respondents, especially housing target groups but also the non-profit & public sector, desire a higher degree of participation in the design of Erlenmatt. This requires a continuation of the dialogue and a mutual sustainability learning of science and practice on equal footing (Hansmann, 2010; Scholz, 2011). This may help to solve problems of communication and perception, thus avoiding blockages and sub-optimal solutions in the urban redevelopment project. An understanding of which views different stakeholder groups have can aid urban planning in the sustainable transition of the district.

The thesis found four sustainability factors for the market success of sustainable property investment: building materials and energy; expenses, return, and flexibility; green space design; and landscape and natural ecology. In key financial stakeholders' views, a sustainable social infrastructure depends upon these sustainability factors. It is as important as building materials and energy; expenses, return, and flexibility, and more important that green space design and landscape and natural ecology. Nonetheless, all of these sustainability criteria were identified to be important for the market success of sustainable property investment. These insights can be used for a sustainable development of Erlenmatt that is successful on the housing market.

In the long run, the design components identified in this thesis can inform the efforts of urban planning for a sustainable urban transition. In particular, they can inform the revision of the Urban District Development Plan for the Integrative Revaluation of Kleinbasel (STEP IAK) (RR-BS, 2004), campaigns for urban housing (Moll, 2007; RR-BS,

2005a), the report on sustainable development (RR-BS, 2005b), the controlling and monitoring report (Moll *et al*., 2007), and Basel dialogue processes (e.g., RR-BS & CMS, 2010). By integrating lifestyle research into urban planning, sustainable urban transitions can be effectively planned not only by science but also in collaboration with practice communities.

5.4 Outlook

Gaps for future research and practice include the investigation of the sustainability management effect, urban management, change in values, socio-demographic change, and feedback loops. The sustainability management effect is a positive predictor of institutional investors' market acceptance of S-REFs. The types and functioning of such a sustainability management effect in urban planning are, however, still largely unclear. Moreover, urban planning is just one type of managing urban systems. Other types of managing urban systems, such as municipal networks, local and national urban policies, and programmes, may complement a sustainable transition of urban systems (cf. UN-Habitat, 2010). From the investors' point of view, planning and construction are dependent upon the current "Zeitgeist" (cf. Kriese & Scholz, submitted). These changes in values reflect changes in lifestyles, and ultimately, changes in the built environment. However, while trying to satisfy market needs, many investors and other stakeholder groups agree on the demand for providing sustainable built environments that satisfy dwellers' needs for expressing special types of lifestyles. Dwellers' lifestyles stimulate feedback mechanisms in the housing market. In order to examine the efficacy and efficiency of feedback loops in the housing market that are due to lifestyles, controlled panel studies are needed. They may result in a life-cycle perspective of lifestyles that include ecological, social and economic impacts which are due to different lifestyles in human systems. Such a life-cycle perspective of lifestyles may serve for a better understanding of how material flows take place within and between urban systems.

5.5 References

Blasius, J., & Friedrichs, J. (2008). Lifestyles in distressed neighborhoods: A test of Bourdieu's "taste of necessity" hypothesis. *Poetics*, *36*(1), 24–44.

Blokland, T. (2008). 'You got to remember you live in public housing': Place-making in an American housing project. *Housing, Theory and Society*, *25*(1), 31-46.

Bourdieu, P. (2007). *Distinction: A social critique of the judgement of taste*. Cambridge, MA: Harvard University Press.

Fiske, S. T., & Taylor, S. E. (2008). *Social cognition: From brains to culture* (3rd ed.). New York, NY: McGraw-Hill.

Guy, S., & Marvin, S. (1999). Understanding sustainable cities: Competing urban futures. *European Urban and Regional Studies*, *6*(3), 268–275.

Hahn, T., & Scheermesser, M. (2006). Approaches to corporate sustainability among German companies. *Corporate Social Responsibility and Environmental Management*, *13*(3), 150–165.

Hansmann, R. (2010). "Sustainability learning": An introduction to the concept and its motivational aspects. *Sustainability*, *2*(9), 2873-2897.

Harth, A., Herlyn, U., & Scheller, G. (1998). Segregation in eastern German cities: Gentrification, downgrading of large estates, and suburbanization. *Journal of Housing and the Built Environment*, *13*(4), 421-437.

Kriese, U., & Scholz, R. W. (2011). The positioning of sustainability within residential property marketing. *Urban Studies*, *48*(7), 1503-1527.

Kriese, U., & Scholz, R. W. Lifestyle ideas of house builders and housing investors - Views of a conservative branch. Manuscript submitted for publication.

Lastovicka, J. L., Bettencourt, L. A., Shaw Hugner, R., & Kuntze, R. J. (1999). Lifestyle of the tight and frugal: Theory and measurement. *Journal of Consumer Research*, *26*(1), 85-98.

Laws, D., Scholz, R. W., Shiroyama, H., Susskind, L., Suzuki, T., & Weber, O. (2004). Expert views on sustainability and technology implementation. *International Journal of Sustainable Development and World Ecology*, *11*(3), 247-261.

McDonald, S., Oates, C. J., Young, C. W., & Hwang, K. (2006). Toward sustainable consumption: researching voluntary simplifiers. *Psychology and Marketing*, *23*(6), 515-534.

Moll, C. (2006). *Bevölkerungsanalyse 1990-2005: Bericht im Auftrag des Regierungsrates*. Basel: Statistisches Amt des Kantons Basel-Stadt (available at: http://www.statistik-bs.ch/ [retrieved 03 August 2009]).

Moll, C., Schaulin, S., Kilchenmann, C., & Pfeifer, A. (2007). *Stadtentwicklung Basel-Nord: Controlling- und Monitoringbericht 2007*. Basel: Statistisches Amt des Kantons Basel-Stadt (available at: http://www.statistik-bs.ch/ [retrieved July 11, 2010]).

O'Conor, R. M., Johannesson, M., & Johansson, P. O. (1999). Stated preferences, real behaviour and anchoring: some empirical evidence. *Environmental and Resource Economics, 13*(2), 235–248.

Rawls, J. (1999). *A theory of justice* (2nd ed.). Oxford: Oxford University Press.

Regierungsrat des Kantons Basel-Stadt (RR-BS) (2004). *Stadtteilentwicklungsplan Integrale Aufwertung Kleinbasel IAK: Ausgabe 2004*. Basel: Druckerei Thoma AG (available at: http://www.baselnord.bs.ch/ [retrieved May 02, 2009]).

Regierungsrat des Kantons Basel-Stadt (RR-BS) (2005a). *Ratschlag betreffend Finanzierung der Stadtentwicklung Basel-Nord* (Geschäfts-Nr. 05.0278.01). Basel: Kreis Druck AG (available at: http://www.regierungsrat.bs.ch/ [retrieved 02 May 2009]).

Regierungsrat des Kantons Basel-Stadt (RR-BS) (2005b). *Zukunft Basel konkret: Bericht zur nachhaltigen Entwicklung Basel-Stadt 2005*. Basel: Kreis Druck AG (available at: http://www.statistik-bs.ch/ [retrieved March 19, 2009]).

Regierungsrat des Kantons Basel-Stadt (RR-BS), & Christoph Merian Stiftung (CMS) (2010). *Basler Dialog 2010: „Stadtwohnen für alle – Aufwertung und/oder Verdrängung"*. Basel: RR-BS (available at: http://www.medienmitteilungen.bs.ch/ [retrieved August 03 2010]).

Rifkin, J. (1990). *The green lifestyle handbook*. New York, NY: Henry Holt and Company.

Sayce, S., Ellison, L., & Parnell, P. (2007). Understanding investment drivers for UK sustainable property. *Building Research & Information, 35*(6), 629-643.

Scholz, R. W. (2011). *Environmental literacy in science and society: From knowledge to decisions*. Cambridge: Cambridge University Press.

Scholz, R. W., Lang, D. J., Wiek, A., Walter, A. I., & Stauffacher, M. (2006). Transdisciplinary case studies as a means of sustainability learning: Historical framework and theory. *International Journal of Sustainability in Higher Education, 7*(3), 226-251.

Scholz, R. W., & Tietje, O. (2002). *Embedded case study methods: Integrating quantitative and qualitative knowledge*. Thousand Oaks, CA: Sage.

Schrage, M. (2007). The myth of commoditization. *MIT Sloan Management Review, 48*(2), 10-14.

Sen, A. (2001). *Development as freedom*. Oxford: Oxford University Press.

Steg, L. (2005). Car use: Lust and must. Instrumental, symbolic and affective motives for car use. *Transportation Research A, 39*(2-3), 147-162.

Swiss Funds Association (SFA) (2010). *Swiss Fund Data*. Zurich: SFA (available at: http://www.swissfunddata.ch/index_en.html [retrieved August 17, 2010]).

Tajfel, H., & Turner, J. C. (1986). The social identity theory of intergroup behavior. In S. Worchel, & W. G. Austin (Eds.), *The psychology of intergroup relations* (pp. 7-24). Chicago, IL: Nelson-Hall.

Talen, E. (1997). The social equity of urban service distribution: An exploration of park access in Pueblo, Colorade, and Macon, Georgia. *Urban Geography*, *18*(6), 521-541.

United Nations Human Settlements Programme (UN-Habitat) (2010). *Urban management programme*. Nairobi: UN-Habitat (available at: http://www.unhabitat.org/ [retrieved August 16, 2010]).

Appendix A: Additional publications and presentations

Peer-reviewed manuscripts

Kriese, U., Bügl, R., & Scholz, R.W. (accepted). Market Actors' Views on Urban Family Living: Informing Urban Planning and Place Marketing in Preparation for Urban Transitions. *European Planning Studies*.

Conference proceedings

Bügl, R., Kriese, U., Scholz, R.W., Lehmann Pollheimer, D., & Stauffacher, M. (2009). *Transforming a former railways freight yard into a modern and sustainable mixed urban district: The case of Erlenmatt in the Canton of Basel-Stadt.* In The Alliance for Global Sustainability (AGS) (ed.), Urban futures: the challenge of sustainability - abstracts book annual meeting (p. 77), 26-29 January 2009, Zurich, Switzerland.

Bügl, R., Scholz, R.W., Kriese, U., & Lehmann Pollheimer, D. (2008). *Key stakeholders are featuring social infrastructure and lifestyles of residential target groups: Sustainable development of new city areas (Basel-Erlenmatt).* In C.H. Daub, P. Burger, & Y. Scherrer (eds.), Creating values for sustainable development: Proceedings of the 2nd International Sustainability Conference (pp. 238-240), 21-22 August 2008, Basel, Switzerland.

Scholz, R.W., Bügl, R., Hüni, G.R., & Leimgruber, C. (2008). *Behavioral finance of sustainable real estate funds*. In C.H. Daub, P. Burger, & Y. Scherrer (eds.), Creating values for sustainable development: Proceedings of the 2nd International Sustainability Conference (pp. 104-106), 21-22 August 2008, Basel, Switzerland.

Presentations

Bügl, R., Kriese, U., Scholz, R.W., Lehmann Pollheimer, D., & Stauffacher, M. (2009). *Transforming a former railways freight yard into a modern and sustainable mixed urban district: The case of Erlenmatt in the Canton of Basel-Stadt.* In The Alliance

for Global Sustainability (AGS) (ed.), Urban futures: the challenge of sustainability - abstracts book annual meeting (p. 77), 26-29 January 2009, Zurich, Switzerland.

Scholz, R.W., Bügl, R., Hüni, G.R., & Leimgruber, C. (2009). *The importance of social criteria for responsible property investment: A Swiss view on the market success of sustainable real estate funds*, presented at the "European Real Estate Society (ERES) Conference 2009", 24-27 June 2009, Stockholm, Sweden.

Bügl, R., Scholz, R.W., Kriese, U., & Lehmann Pollheimer, D. (2008). *Key stakeholders are featuring social infrastructure and lifestyles of residential target groups: Sustainable development of new city areas (Basel-Erlenmatt)*. In C.H. Daub, P. Burger, & Y. Scherrer (eds.), Creating values for sustainable development: Proceedings of the 2nd International Sustainability Conference (pp. 238-240), 21-22 August 2008, Basel, Switzerland.

Scholz, R.W., Bügl, R., Hüni, G.R., & Leimgruber, C. (2008). *Behavioral finance of sustainable real estate funds*. In C.H. Daub, P. Burger, & Y. Scherrer (eds.), Creating values for sustainable development: Proceedings of the 2nd International Sustainability Conference (pp. 104-106), 21-22 August 2008, Basel, Switzerland.

Bügl, R., Leimgruber, C., Hüni, G.R., & Scholz, R.W. (2007). *Empirically validated criteria for sustainable real estate funds*, presented at the "Environmental Psychology Conference 2007", 09-12 September 2007, Bayreuth, Germany.

Bügl, R., Loukopoulos, P., & Scholz, R.W. (2006). *Identifying and assessing the influence of real estate investors' self-conceptions and beliefs for sustainable urban development and form*, presented at the "11th International Conference on Travel Behaviour Research", 16-20 August 2006, Kyoto, Japan.

Research reports

Project team "Investors construct lifestyles" (2009). *Nachhaltige Siedlungs- und Infrastrukturentwicklung: Investoren bauen Lebensstile - Ein Leitfaden zur Selbstreflexion*. Basel: ecos.

Project team "Investors construct lifestyles" (2009). *Scientific final report - Investors construct lifestyles: Lifestyle concepts of investors and project developers, their relevance for promoting sustainable city development and means to enforce adequate discussion about them*. Bern: Swiss National Science Foundation.

Scholz, R.W., & Bügl, R. (2007). *Expertise zur sozialen Nachhaltigkeit - Qualitative soziale Nutzungs- und Lebenszyklusanalyse des Projektes Bebauung Giessen in Dübendorf: Begutachtungsstudie*. Zurich: ETH-NSSI.

Appendix B: Curriculum vitae

December 15, 1975		Born in Freising, Germany
Education	1988 - 1992	Secondary school certificate at the Secondary School in Pfaffenhofen/Ilm, Germany
	1994 - 1996	A-levels at the Upper Vocational School in Scheyern, Germany
	1998 - 2005	Diploma in psychology at the University of Koblenz-Landau (undergraduate studies) and the University of Konstanz (graduate studies), Germany
Professional career	1992 - 1994	Chamber of commerce certificate as an industrial manager at the Urbanus Brewery GmbH in Pfaffenhofen/Ilm, Germany
	2002	Quantitative full service internship at the Konkret Institute for Innovative Market and Opinion Research in Bremen, Germany
	2003 - 2005	Academic aide for methods, statistics and programming at the University of Konstanz, Germany
	2005 - 2010	Post-graduate assistant at the Chair of Environmental Sciences at the Swiss Federal Institute of Technology Zurich, Switzerland
	2010 -	Junior Research Manager at K&A BrandResearch AG, Röthenbach/Pegnitz, Germany
Scholarships	1997 - 1998	Vocational Training Programme for the Highly Talented at the Federal Ministry for Education, Science, Research and Technology, Germany
	2001 - 2002	Erasmus grant (Socrates II programme of the European Union) at the University of Padova, Italy
	2006	11th IATBR Conference grant of the Huber-Kudlich Foundation at the University of Kyoto, Japan
Alternative service	1996 - 1997	Hospital care in abdominal- and vascular surgery, District Hospital in Pfaffenhofen/Ilm, Germany